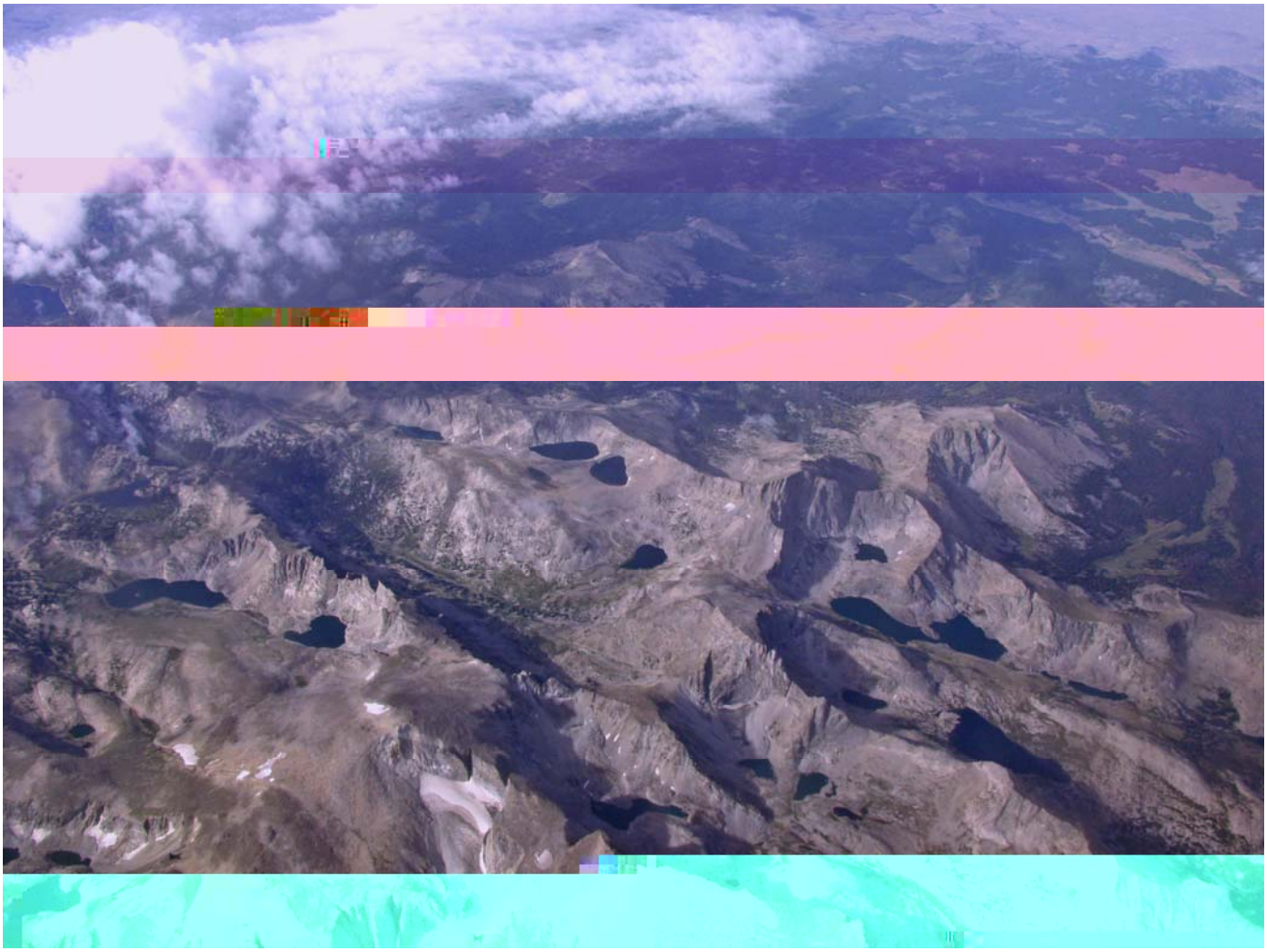
GEOMORPHIC DESCRIPTION SYSTEM

Version 4.11

06 / 02 / 2008



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Cover Photo: Wind River Range, WY (N 42.69° Lat., W109.16° Long.) approximately 25 miles southwest of Lander. Glaciated mountains with arêtes, horns, cirques, and tarns. View is southwest. The snow patch, at lower, middle image, is on Wind River Peak's north flank. This peak and the adjacent north-south, sharp-crested ridge mark the continental divide. East Temple and Temple peaks are west of the divide. The larger tarns include Tayo, Frozen, Temple, and Deep Lakes. The underfit, southerly flowing stream in a U-shaped valley is Little Sandy Creek. Photo Doug Wysocki August 2007.

GEOMORPHIC DESCRIPTION SYSTEM

Version 4.11

06/ 02 / 2008

This version includes changes and additions (in **bold**) since the previous official GDS release (version 4.0; 4/16/2007), NASIS (June 2007), and the affiliated National Soil Survey Handbook, Part 629 (NSSH Amendment # 12, May 2007).

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Acknowledgments

This document builds upon and in part is a testament to earlier geomorphologic publications focused toward Soil Survey. Two publications deserve specific mention -- John Hawley and Roger Parsons's *Glossary of Selected Geomorphic and Geologic Terms* (1980) provided landform definitions for the western USA; and Fred Peterson's landmark *Landforms of the Basin and Range Provinces defined for Soil Survey* (1981) devised a regional landform description guide combined with outstanding graphics. Soil scientists used the geomorphic and geologic terminology summarized in those documents during an important soil inventory era in the USA. The earlier contributions form a foundation and give inspiration for this endeavor and the companion document *Glossary of Landform and Geologic Terms*. .

We dedicate special thanks and recognition to Dr. Erling Gamble (USDA - Soil Conservation Service, retired) who participated in the initial formative stage of the *GDS and Glossary*. His training with Dr. James Thorpe (Earlham College) and collaborative work with Dr. Raymond Daniels (USDA- SCS), as well as his own growth in this profession are a thoughtful and constructive part of this work. The Soil Survey Division of the USDA – Natural Resource Conservation Service (*formerly the USDA - Soil Conservation Service*) supported this project.

Correct document citation:

> **Schoeneberger, P.J. and Wysocki, D.A. 2008. Geomorphic Description System, (Version 4.11). National Soil Survey Center, Natural Resources Conservation Service, USDA, Lincoln, NE.**

The initial GDS release (1994) occurred internally within NRCS. A condensed external GDS publication (Version 2.06) followed (Schoeneberger and Wysocki, 1998). This version updates and replaces GDS (Version 3.1) (Schoeneberger and Wysocki, 2002).

Foreword

Purpose: This document provides a descriptive method and a technical guide for applying and understanding geomorphic and geologic concepts and terms for soil inventory in the USA National Cooperative Soil Survey (NCSS) Program.

Content: Definitions, criteria, concepts, and operational guidelines presented here focus on soil inventory needs and applications. Our main goal is clear, consistent definitions and concepts with succinct presentation. Space precludes expansive treatment of all definitions or concepts included herein. Users who seek such should consult original cited sources and additional references.

***Sources*:** This document is a primary source for geomorphic terminology and application for USDA-NRCS and National Cooperative Soil Survey programs. This Geomorphic Description System is contained, in part or in total, in key NRCS documents: National Soil Survey Handbook (*NSSH*), Part 629 (Soil Survey Staff, 2007); the Field Guide for Describing and Sampling Soils, version 2.0 (Schoeneberger, et al., 2002); National Soil Information System (*NASIS*), ver. 6.1 (NRCS, 2007). Information drawn from original sources is noted and given appropriate citation. We hope this facilitates access to original sources and encourages greater topical exploration.

Goal: Describe and record what exists in the field. Choice lists and terms that follow constitute a minimal set of descriptors. Accurate, complete geomorphic field assessment may require additional adjectives, descriptors, and sketches to capture and convey pertinent information where established terms are lacking. Record the additional information as free-hand notes.

Changes: Soil Science and Soil Geomorphology are evolving fields. Changes in this system should and will occur. Please send comments or suggestions to the authors at the National Soil Survey Center, USDA - NRCS, 100 Centennial Mall North - Rm. 152, Lincoln, NE 68508-3866

Status: This version contains new terms (highlighted in **bold**) that have been added for National Soil Information System - NASIS, version 6.1; NASIS Data Dictionary (5/2007), National Soil Survey Handbook, Part 629 (May, 2007); the Field Book for Describing and Sampling Soils, version 2.0. These changes may post-date and therefore may not be shown in other related documents. Updates will be made to all related documents at the first opportunity.

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BACKGROUND

Landforms are visually recognizable earth surface features that provide humans a sense of location. In fact, humans have informally described landforms throughout history mainly as landmarks, obstacles to travel, or military value. Soil occurrence across the earth's surface corresponds remarkably with landform type and distribution. Soil scientists during the soil survey process develop landscape models that quantify soil landform relationships. Soil scientists can understand and convey much about soil distribution by employing landform description. Effective communication of such knowledge, whether among scientists, or between scientists and the public, requires consistent landform description.

A long-standing need exists to clarify and communicate geomorphic concepts and terms in Soil Science, as well as, the National Cooperative Soil Survey. A broadly applicable set of geomorphic descriptors needs to be comprehensive, consistently defined, and follow an organized array. This *Geomorphic Description System* (GDS) addresses those needs by presenting, defining, and organizing terminology. Various considerations including, but not limited to time constraints, the need to blend formal and informal terms and concepts, and competing terms and philosophies complicated the GDS design. Consequently, this system is a compromise between straightforward practicality and strict scientific rigor.

Goals in building the GDS:

1) Foster national use of standard terms:
   - Enhance the utility and scientific credibility of geomorphic information contained in National Cooperative Soil Survey databases and products.
   - Imrove technical communication both within and outside NRCS.
   - Encourage use of established, scientifically credible terms.

2) Maximize use of existing geomorphic information in NCSS databases and programs.

Specific Objectives:

1) Comprehensively organize geomorphic and related terminology for use in the National Cooperative Soil Survey (NCSS) and Soil Science.

2) Update, revise, and improve geomorphic terminology in the NCSS:
   - Clarify terms to minimize erroneous use.
   - Remove obsolete terms and concepts.
   - Minimize redundant, competing, and conflicting terms; [e.g. water course terms: arroyo, coulee, drainageway, draw, gulch, gully, ravine, and wash.]

3) Completeness (incorporate user-requested modifications and needs):
   - Fill gaps: add new, or create terms in response to requests; construct "suites of terms" that provide all pertinent options.
   - Focus on previously under-represented regions and minimize regional biases.

INTRODUCTION

This system is a comprehensive presentation of geomorphic terms used in the National Cooperative Soil Survey Program (NCSS) and in the Soil Science profession at large. Its purpose is to enable one to effectively describe the geomorphic setting and context of a given point or area on the Earth's surface: to convey it's form and content, and where possible, to indicate what processes or environments have dominated it's evolution and contributed to it's present state, composition, and distribution.

Categories (e.g., *Landscape*), are called "data elements" in the National Soils Information System (NASIS) and defined in Appendix 1. Each category (e.g., *Landscape*) contains various choices (e.g., *mountains, plains*) which are tallied in lists. All geomorphic "choice-list" terms are defined in the Glossary of Geologic and Landform Terms - Part 629, National Soil Survey Handbook, (Soil Survey Staff, 2007), which should be considered a companion document (reproduced here as Appendix 2).

Many terms are drawn from geology, whereas others are modified for, or are unique to, Soil Science. The terminology and definitions are generally in agreement with, but in some cases more comprehensive than those in the Glossary of Soil Science Terms (Soil Science Society America, 2001).

GDS Organization

The ***Geomorphic Description System*** **(GDS)** consists of three specific sections:

I) Physiographic Location : Where - Specifies an existing and named geomorphic area with a defined location. [1]

II) Geomorphic Description : What - Identifies a discrete land surface feature (separate entitiy) or assemblage of features.

How - Categorizes features by dominant origin process or geomorphic setting.

III) Surface Morphometry : Shape - Describes land surface shapes or geometry.

Pieces **-** Identifies a discrete and geomorphically defined land area or slope segment

[[1]*Note*: Physiographic Location choice-lists contain area names that are dominantly geomorphically or geologically defined, but can include culturally or geo-politically defined areas. Thus all terms used in the Physiographic Location section may not be consistent with Glossary definitions.]

Document Design

This document presents the GDS in increasing detail in three ways.

1) A one-page abbreviated outline of the major GDS sections (p. 7).

2) A detailed outline with explanatory comments and examples (p. 8 - 11)

3) The complete GDS: all data elements and choice lists (p. 12 - 56).
   Appendices: important supplemental information (definitions, maps, etc.).

GEOMORPHIC DESCRIPTION SYSTEM

(VERSION 4.11 06/02/2008)

ABBREVIATED OUTLINE

PART I : PHYSIOGRAPHIC LOCATION

- **A) PHYSIOGRAPHIC DIVISION**
- **B) PHYSIOGRAPHIC PROVINCE**
- **C) PHYSIOGRAPHIC SECTION**
- **D) STATE PHYSIOGRAPHIC AREA** (OPTIONAL)
- **E) LOCAL PHYSIOGRAPHIC / GEOGRAPHIC NAME** (OPTIONAL)

PART II : GEOMORPHIC DESCRIPTION

- **A) LANDSCAPE**
- **B) LANDFORM**
- **C) MICROFEATURE**
- **D) ANTHROPOGENIC FEATURES**

PART III : SURFACE MORPHOMETRY

- **A) ELEVATION**
- **B) SLOPE ASPECT**
- **C) SLOPE GRADIENT**
- **D) SLOPE COMPLEXITY**
- **E) SLOPE SHAPE**
- **F) HILLSLOPE - PROFILE POSITION**
- **G) GEOMORPHIC COMPONENT :**
    - **1) HILLS**
    - **2) TERRACES, STEPPED LANDFORMS**
    - **3) MOUNTAINS**
    - **4) FLAT PLAINS**
- **H) MICRORELIEF**
- **I) DRAINAGE PATTERN**

GEOMORPHIC DESCRIPTION SYSTEM

(VERSION 4.11 06/02/2008)

DETAILED OUTLINE

PART I : PHYSIOGRAPHIC LOCATION

A) PHYSIOGRAPHIC DIVISION
(Formerly called Region in earlier versions;
Choices are expanded from Fenneman 1931, 1938)

B) PHYSIOGRAPHIC PROVINCE
(Choices are expanded from Fenneman, 1931, 1938)

C) PHYSIOGRAPHIC SECTION
(Choices are expanded from Fenneman 1931, 1938)

- -

[These final two levels are optional and intended to allow use of more localized area names.]

D) STATE PHYSIOGRAPHIC AREA (OPTIONAL)
- to be developed in conjunction with, or obtained from, the local State Geologic Survey or it's equivalent.

E) LOCAL PHYSIOGRAPHIC / GEOGRAPHIC NAME (OPTIONAL)
- to be developed in conjunction with, or obtained from, the local State Geologic Survey;
- may include area names found on USGS 7.5 or 15 minute topographic maps.

Example for Physiographic Location:

A. Interior Plains
B. Central Lowland
C. Wisconsin Driftless Section
D. Wisconsin Dells
E. Robert's Ridge

PART II : GEOMORPHIC DESCRIPTION

[A term should only be used once in a microfeature-landform-landscape descriptive string. For example, if a term is used as a landscape term (e.g. *river valley*) it should not be repeated as a landform term in the same descriptive string. A different term that conveys additional information should be used (at either level); e.g. *flood plain* (LF term) *in a river valley* (LS term), rather than a *river valley* (LF term) *in a river valley* (LS term).]

A) LANDSCAPE (replaces "Major Landform")

examples: badlands
foothills

B) LANDFORM (replaces "Local Landform")

1. Single Landform

- occurrence on a single type of landform

examples: stream terrace, hill (singular: a pedon or point data)
examples: stream terraces, hills (plural: pedons or map unit).

2. Multiple Landforms:

a) Landform on a Landform (nested landforms):

- commonly used for locating a pedon or a small study site;
- listed in ascending order of scale

examples: a blowout in a sand dune on a stream terrace;
a mudflow on a cinder cone, in a caldera.
a talus slope on an escarpment on a lava flow, in a valley.

b) Occurrence across multiple landforms

- commonly used for locating a map unit, official series descriptions, deposits, or large study sites.

example: This map unit occurs on levees, crevasse splays, and sand bars.

C) MICROFEATURE (OPTIONAL) (new data element: replaces "Microrelief Feature - Kind" and "Microrelief Feature - Pattern")

examples: gilgai
tree-tip mound

D) ANTHROPOGENIC FEATURES (new data element: contains some terms formerly found in "Microrelief Feature - Kind")

example: borrow pit

PART III : SURFACE MORPHOMETRY

A) ELEVATION:

- The height of a point on the earth's surface, relative to mean sea level (msl); indicate units.

examples: 106 m
348 ft.

B) SLOPE ASPECT:

- The compass bearing (in degrees, accounting for declination) that a slope faces, looking downslope.
- Generalized, "quadrant" descriptions (e.g., SSW = south by southwest) are too general to be useful.

examples: 218°
SW (*too general; obsolete*)

C) SLOPE GRADIENT:

- The angle (in percent) of the ground surface, off the horizontal plane, through a point or site, and in the direction that overland water would flow; commonly called "slope".

example: 17%

D) SLOPE COMPLEXITY:

- Used to simplistically describe the relative linearity (simple) or irregularity (complex) of the ground surface leading downslope and through the point or map unit of interest.

examples: simple
complex

E) SLOPE SHAPE:

DOWN SLOPE & ACROSS SLOPE
(Vertical) (Horizontal)

examples: Concave - Convex
Linear - Concave

F) HILLSLOPE - PROFILE POSITION (replaces "Hillslope Component")

- 2 dimensional
- Used to describe location of a point or pedon along a longitudinal slope profile (down slope).
- Appropriate for use with point data, generally not recommended for map units.

examples: shoulder
backslope

G) GEOMORPHIC COMPONENT: (replaces PDP 3.6's "Geomorphic Surface")

- 3 dimensional
- Used to describe location of areas (e.g. map units, inclusions).

1) HILLS :

examples: head slope
side slope

2) TERRACES, STEPPED LANDFORMS :

examples: tread
riser

3) MOUNTAINS :

examples: mountaintop
mountainflank

4) FLAT PLAINS :

examples: talf
rise

H) MICRORELIEF : Microrelief refers to minor, relative elevational differences between adjacent areas or microfeatures).

examples: micro-high
micro-low

I) DRAINAGE PATTERN : The configuration or arrangement, in plan view, of the stream courses in an area. It is related to the local geologic materials, geomorphologic features and history of the area; examples include dendritic, trellis, artificial, etc.; also called "drainage network".

example: dendritic

GEOMORPHIC DESCRIPTION SYSTEM

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PART I : PHYSIOGRAPHIC LOCATION

A) PHYSIOGRAPHIC DIVISION
(Choices are expanded from Fenneman, 1931, 1938, 1946)

B) PHYSIOGRAPHIC PROVINCE
(Choices are expanded from Fenneman, 1931, 1938, 1946)

C) PHYSIOGRAPHIC SECTION
(Choices are expanded from Fenneman, 1931, 1938, 1946)

- -

D) STATE PHYSIOGRAPHIC AREA (OPTIONAL)

E) LOCAL PHYSIOGRAPHIC / GEOGRAPHIC NAME (OPTIONAL)

[Note: The following map-unit descriptions (Fenneman, 1946) contain some concepts considered to be outdated (e.g., the Davisian landscape stages of youth, maturity, and old age). Nonetheless, the map units are largely sound and convey useful information. An italicized NASIS code, if available, follows each term (e.g., Coastal Plain *CP*).]

A) Physiographic Divisions

B) Physiographic Provinces
C) Physiographic Sections

Laurentian Upland *LU*

1. Superior Upland *SU*
[Submaturely dissected, recently glaciated peneplain on crystalline rocks of complex structure.]

Atlantic Plain *AP*

2. Continental Shelf *CS*
[Sloping submarine plain of sedimentation; *not delimited on NRCS map used in this document*.]
3. Coastal Plain *CP*
   - a. Embayed section *EMS*
     [Submaturely dissected and partly submerged, terraced coastal plain.]
   - b. Sea Island section *SIS*
     [Young to mature terraced coastal plain with submerged border.]
   - c. Floridian section *FLS*
     [Young marine plain, with sand hills, swamps, sinks, and lakes.]
   - d. East Gulf Coastal plain *EGC*
     [Young to mature belted coastal plain.]
   - e. Mississippi alluvial valley *MAV*
     [Flood plain and delta.]
   - f. West Gulf Coastal plain *WGC*
     [Young grading inland to mature coastal plain.]

Physiographic Divisions	***Physiographic Provinces & Sections***
Appalachian Highlands *AH*	4. Piedmont Province *PP* a. Piedmont upland *PIU* [Submaturely dissected peneplain on disordered resistant rocks; moderate relief.] b. Piedmont lowlands *PIL* [Less uplifted peneplain on weak strata; residual ridges on strong rocks.] 5. Blue Ridge Province *BR* a. Northern section *NOS* [Maturely dissected mountains of crystalline rocks; abundant altitudes.] b. Southern section *SOS* [Subdued mountains of disordered crystalline rocks] 6. Valley and Ridge Province *VR* a. Tennessee section *TNS* [Second-cycle mountains of folded strong and weak strata; valley belts predominate over even-crested ridges.] b. Middle section *MIS* [The same as previous section except that even-crested ridges predominate over the valleys except on the east side.] c. Hudson Valley *HUV* [Glaciated peneplain on weak folded strata.] 7. St. Lawrence Valley *SL* a. Champlain section *CHS* [Rolling lowland, glaciated; in part covered by young marine plain.] b. St Lawrence Valley,-northern section *NRS* [Young marine plain with local rock hills.] 8. Appalachian Plateau *AP* a. Mohawk section *MOS* [Maturely dissected glaciated plateau; varied relief and diverse altitudes.] b. Catskill section *CAS* [Maturely dissected plateau of mountainous relief and coarse texture (glaciated).] c. Southern New York section *SNY* [Mature glaciated plateau of moderate relief.] d. Allegheny Mountain section *AMS* [Mature plateau of strong relief; some mountains due to erosion of open folds.]

Physiographic Divisions	**Physiographic Provinces & Sections**
Appalachian Highlands *AH* (*continued*)	e. Kanawha section *KAS* [Mature plateau of fine texture; moderate to strong relief.] f. Cumberland Plateau section *CPS* [Submaturely dissected plateau of moderate to strong relief.] g. Cumberland Mountain section *CMS* [Higher mature plateau and mountain ridges on eroded open folds.]
	9. New England Province *NE* a. Seaboard lowland section *SLS* [Peneplains below 500 ft. elevation, postmaturely eroded and glaciated; few monadnocks.] b. New England upland section *NEU* [Dissected and glaciated peneplains on complex structural features; monadnocks.] c. White Mountain section *WMS* [Subdued glaciated mountain masses of crystalline rocks.] d. Green Mountain section *GMS* [Linear ranges of subdued and glaciated mountains and residual plateaus.] e. Taconic section *TAS* [Maturely dissected and glaciated mountains and peneplain on resistant folded strata.]
	10. Adirondack Province *AD* [Subdued mountains and dissected peneplain, glaciated.]
Interior Plains *IN*	11. Interior Low Plateaus *IL* a. Highland rim section *HRS* [Young to mature plateau of moderate relief.] b. Lexington lowland *LEL* [Mature to old plain on weak rocks, trenched by main rivers.] c. Nashville basin *NAB* [Mature to old plain on weak rocks; slightly uplifted and moderately dissected.] d. Possible western section *WES* [Low, maturely dissected plateau with silt-filled valleys.] (not delimited on map)
	12. Central Lowland Province *CL* a. Eastern lake section *ELS* [Maturely dissected and glaciated cuestas and lowlands; moraines, lakes, and lacustrine plains.]

Physiographic Divisions	**Physiographic Provinces & Sections**
Interior Plains *IN* (*continued*)	b. Western lake section *WLS* [Young glaciated plain; moraines, lakes, and lacustrine plains.] c. Wisconsin driftless section *WDS* [Maturely dissected plateau and lowland invaded by glacial outwash. (Margin of older, eroded drift is included).] d. Till plains *TIP* [Young till plains; moraine topography is rare, no lakes.] e. Dissected till plains *DTP* [Submaturely to maturely dissected till plains.] f. Osage plain *OSP* [Old scarped plains beveling faintly inclined strata; main streams are entrenched.]
	13. Great Plains Province *GP* a. Missouri plateau, glaciated *MPG* [Glaciated old plateaus; isolated mountains.] b. Missouri plateau, unglaciated *MPU* [Old plateau; terrace lands; local badlands; isolated mountains.] c. Black Hills *BLH* [Maturely dissected domed mountains.] d. High Plains *HIP* [Broad inter-valley remnants of smooth fluvial plains.] e. Plains Border *PLB* [Submaturely to maturely dissected plateau.] f. Colorado Piedmont *COP* [Late mature to old elevated plain.] g. Raton section *RAS* [Trenched peneplain surmounted by dissected, lava-capped plateaus and buttes.] h. Pecos valley *PEV* [Late mature to old plain.] i. Edwards Plateau *EDP* [Young plateau with margin of moderate to strong relief.] k. Central Texas section *CTS* [Plateau in maturity and later stages of erosion.]
[This Division also includes portions of Alaska (see Alaskan Physiographic Areas)]	
Interior Highlands *IH*	14. Ozark Plateau *OP* a. Springfield-Salem plateaus *SSP* [Submature to mature plateaus.] b. Boston "Mountains" *BOM* [Submature to mature plateau of strong relief.]

Physiographic Divisions	**Physiographic Provinces & Sections**
Interior Highlands *IH* (*continued*)	15. Ouachita Province *OU* a. Arkansas Valley *ARV* [Gently folded strong and weak strata; peneplain with residual ridges.] b. Ouachita Mountains *OUM* [Second-cycle mountains of folded strong and weak strata.]
Rocky Mountain System *RM*	16. Southern Rocky Mountains *SR* [Complex mountains of various types; intermontane basins.]
	17. Wyoming Basin *WB* [Elevated plains in various stages of erosion; isolated low mountains.]
	18. Middle Rocky Mountains *MR* [Complex mountains, mainly anticline ranges; intermontane basins.]
	19. Northern Rocky Mountains *NR* [Deeply dissected mountain uplands, not anticline ranges; intermontane basins.]
[This Division also includes portions of Alaska (see Alaskan Physiographic Areas)]	
Intermontane Plateaus *IP*	20. Columbia Plateau *CR* a. Walla Walla Plateau *WWP* [Rolling plateau with young incised valleys.] b. Blue Mountain section *BMS* [Complex mountains and dissected volcanic plateaus.] c. Payette section *PAS* [Young plateaus of prevailingly weak rocks; broad alluvial terraces. Applies only to northern part.] d. Snake River Plain *SRP* [Young lava plateau.] e. Harney section *HAS* [Young lava plateaus, features of recent volcanism; ineffective drainage.]
	21. Colorado Plateau *CO* a. High Plateaus of Utah *HPU* [High block plateaus, in part lava-capped; terraced plateaus on the south side.] b. Uinta Basin *UIP* [Dissected plateau; strong relief.] c. Canyon Lands *CAL* [Young to mature canyoned plateaus; high relief.]

Physiographic Divisions	**Physiographic Provinces & Sections**
Intermontane Plateaus *IP* (*continued*)	d. Navajo section *NAS* [Young plateaus; smaller relief than 21c, into which it grades.] e. Grand Canyon section *GCS* [High block plateaus, trenched by Grand Canyon.] f. Datil section *DAS* [Lava flows entire or in remnants; volcanic necks.] 22. Basin and Range Province *BP* a. Great Basin *GRB* [Isolated Ranges (largely dissected block mountains) separated by aggraded desert plains.] b. Sonoran Desert *SOD* [Widely separated short ranges in desert plains.] c. Salton Trough *SAT* [Desert alluvial slopes and delta plain, Gulf of CA] d. Mexican Highland *MEH* [Isolated ranges (largely dissected block mountains) separated by aggraded desert plains.] e. Sacramento section *SAS* [Mature block mountains of gently tilted strata; block plateaus; bolsons.]
[This Division also includes portions of Alaska (see Alaskan Physiographic Areas)]	
Pacific Mountain *PM*	23. Cascade-Sierra Mountains *CM* a. Northern Cascade Mountains *NCM* [Sharp alpine summits of accordant height; higher volcanic cones.] b. Middle Cascade Mountains *MCM* [Generally accordant summits; higher volc. cones] c. Southern Cascade Mountains *SCM* [Volcanic mountains variously eroded; no very distinct range.] d. Sierra Nevada *SIN* [Block mountain range tilted west; accordant crests; alpine peaks near east side.] 24. Pacific Border Province *PB* a. Puget Trough *PUT* [Lowlands of diverse character; in part submerged.] b. Olympic Mountains *OLM* [Generally accordant crests; local alpine peaks.] c. Oregon Coast Range *OCR* [Uplifted peneplain on weak rocks, dissected; monadnocks of igneous rock.] d. Klamath Mountains *KLM* [Uplifted and dissected peneplain on strong rocks; extensive monadnocks ranges.]

Physiographic Regions	**Physiographic Provinces & Sub-Provinces**
Pacific Mountain *PM* (*continued*)	e. California Trough *CAT* [Low fluvial plain.] f. California Coast Ranges *CCR* [Parallel ranges and valleys on folded, faulted, and metamorphosed strata; rounded crests of sub-equal height.] g. Los Angeles Ranges *LAR* [Narrow ranges and broad fault blocks; alluvial lowlands.]
	25. Lower California Province *LC* [Dissected westward-sloping granite upland (in northern part).]

[This Division also includes portions of Alaska (see Alaskan Physiographic Areas)]

Alaskan Physiographic Areas (Warhaftig, 1965)

The following Alaskan-Peninsula physiographic areas are extensions of the preceding North American Physiographic Divisions (e.g., *Rocky Mountain System*). These Alaskan extensions are presented here, rather than intermingled with the previous Division / Province lists because they a) constitute a geographically coherent package (Wahrhaftig, 1965); b) these extensions were not contained within Fennman's original work which dealt only with the conterminous US (Fenneman, 1931; 1938; & 1946), and c) Wahrhaftig's map-unit numbers are independent of, and inconsistent with Fenneman's. Wahrhaftig's original map unit scheme & numbers are retained here for simplicity in using his map of the Alaskan peninsula. [*CAUTION*: Wahrhaftig's map-unit numbers should not be confused with similar map-unit numbers from Fenneman's map for the conterminous US.]

Physiographic Divisions	**Physiographic Provinces & Sections**
Interior Plains *IN* (*continued*)	1. Arctic Coastal Plain Province -- a. Teshekpuk Hills section -- b. White Hills section --
Rocky Mountains System *RM* (*continued*)	2. Arctic Foothills Province *AF* a. Northern Section -- b. Southern Section --

[Note: The map-unit numbering sequence shown here is from Wahrhaftig (1965), and is independent of, and not consistent with, that of Fenneman]

Physiographic Divisions	**Physiographic Provinces & Sections**
	Arctic Mountains Province *AM* 3. Delong Mountains section -- 4. Noatak Lowlands section -- 5. Baird Mountains section -- 6. Central & Eastern Brooks Range section - 7. Ambler-Chandalar Ridge & Lowland section --
Intermontane Plateaus *IP* *(continued)*	Northern Plateaus Province -- 8. Porcupine Plateau section -- a. Thazzik Mountain 9. Old Crow Plain section -- [noted but not described] 10. Olgivie Mountains section -- 11. Tintina Valley (Eagle Trough) section -- 12. Yukon-Tanana Upland section -- a. Western Part b. Eastern Part 13. Northway - Tanacross Lowland section -- 14. Yukon Flats section -- 15. Rampart Trough section -- 16. Kokrine - Hodzana Highlands section -- a. Ray Mountains b. Kokrine Mountains
	Western Alaska Province -- 17. Kanuti Flats section -- 18. Tozitna - Melozitna Lowland section -- 19. Indian River Upland section -- 20. Pah River Section -- a. Lockwood Hills b. Pah River Flats c. Zane Hills d. Purcell Mountains 21. Koyukuk Flats section -- 22. Kobuk-Selawik Lowland section -- a. Waring Mountains 23. Selawik Hills section -- 24. Buckland River Lowland section -- 25. Nulato Hills section -- 26. Tanana - Kuskowin Lowland section -- 27. Nowitna Lowland section -- 28. Kuskokwim Mountains section --

[Note: The map-unit numbering sequence shown here is from Wahrhaftig (1965), and is independent of, and not consistent with, that of Fenneman]

Physiographic Divisions	**Physiographic Provinces & Sections**
Intermontane Plateaus *IP* *(continued)*	29. Innoko Lowlands section -- 30. Nushagak - Big River Hills section -- 31. Holitna Lowland section -- 32. Nushagak - Bristol Bay Lowland section -- 33. Seward Peninsula Province *SEP* a. Bendeleben Mountains b. Kigluaik Mountains c. York Mountains Bering Shelf Province *BES* 34. Yukon- Kuskokwim Coastal Lowland section -- a. Norton Bay Lowland 35. Bering Platform section -- a. St. Lawrence Island b. Pribilof Island c. St. Matthew Island d. Nunivak Island 36. Ahklun Mountains Province --
Pacific Mountain System *PM* *(continued)*	Alaska - Aleutian Province *AAC* 37. Aleutian Islands section -- 38. Aleutian Range section -- 39. Alaska Range (Southern Part) section -- 40. Alaska Range (Central & Eastern Parts) section -- a. Mentasta - Nutzotin Mountain segment 41. Northern Foothills of the Alaska Range section -- Coastal Trough Province -- 42. Cook Inlet - Susitna Lowland section -- 43. Broad Pass Depression section -- 44. Talkeetna Mountains section -- a. Chulitna Mountains b. Fog Lakes Upland c. Central Talkeetna Mountains d. Clarence Lake Upland e. Southeastern Talkeetna Mountains 45. Upper Matanuska Valley section -- 46. Clearwater Mountains section -- 47. Gulkana Upland section --

[Note: The map-unit numbering sequence shown here is from Wahrhaftig (1965), and is independent of, and not consistent with, that of Fenneman]

Physiographic Divisions	**Physiographic Provinces & Sections**
Pacific Mountain System *PM* *(continued)*	48. Copper River Lowland section -- a. Eastern Part b. Western Part: Lake Louis Plateau 49. Wrangell Mountains section -- 50. Duke Depression [not described] 51. Chatham Trough section -- 52. Kupreanof Lowland section -- Pacific Border Ranges Province *PBS* 53. Kodiak Mountains section -- 54. Kenai - Chugach Mountains section -- 55. St Elias Mountains section -- a. Fairweather Range subsection 56. Gulf of Alaska Coastal section -- 57. Chilkat - Baranof Mountains section -- a. Alsek Ranges subsection b. Glacier Bay subsection c. Chichagof Highland subsection d. Baranof Mountains subsection 58. Prince of Whales Mountains section -- Coast Mountains Province *COM* 59. Boundary Pass section -- 60. Coastal Foothills section --

[Note: The map-unit numbering sequence shown here is from Wahrhaftig (1965), and is independent of, and not consistent with, that of Fenneman]

Other Physiographic Areas

(not addressed by Fenneman, 1946; or Wahrhaftig, 1965)

Physiographic Divisions	**Physiographic Provinces & Sections**
Pacific Rim *PR*	Pacific Islands Province *PI* a. Hawaiian Islands *HAI* b. Guam *GUM* c. Trust Territories ***** *TRT* (e.g., Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Palau, Republic of Marshall Islands, etc.) d. Other

***** Most of the former US Trust Territories of the Pacific are now independent nations. This designation is used here solely to aid accessing archived, historical data.

Physiographic Divisions	**Physiographic Provinces & Sections**
Caribbean Basin *CB*	Caribbean Islands Province *CI* a. Greater Antilles *GRA* (Puerto Rico, Cuba, Hispaniola, Jamaica) b. Lesser Antilles *LEA* (U.S. Virgin Is, Barbados, Grenada, Martinique, etc.) c. Other
Undesignated *UN*	Other *OT* [reserved for international designations not covered above, or temporary use.]

[The final two levels are optional and should be populated at an MLRA or State Office level, in concert with local NCSS University cooperators and the appropriate State Geologic Survey.]

D. STATE PHYSIOGRAPHIC AREA (OPTIONAL)

e.g. *Des Moines Lobe* (IA).

[Entries presently are largely undefined: to be developed in conjunction with each State Geological Survey; target scale approximately 1:100,000 to 1:500,000.]

(see example: Map 2)

E. LOCAL PHYSIOGRAPHIC / GEOGRAPHIC NAME (OPTIONAL)

e.g. *Pilot's Knob* (Cerro Gordo Co., IA).

[Entries presently are largely undefined: to be developed in conjunction with each State Geological Survey; may include area names found on USGS 7.5 & 15 minute topographic maps; target scale approximately 1:24,000.]

(see example: Map 3)

PART II: "GEOMORPHIC DESCRIPTION"

(Complete Choice-Lists and Topical Subsets)

There are various lists of terms within this section. These lists contain only the preferred “landform”-related terms as defined in the *Glossary of Landform and Geologic Terms* , National Soil Survey Handbook - Part 629 (NRCS, 2006) in an effort to encourage the national use of standard terms. Non-landform terms (e.g. geologic materials), undesirable terms (e.g. redundant synonyms, obsolete terms, etc.) retained in the *Glossary* for historical purposes, or legitimate landform terms not recognized in Soil Survey have been omitted from the following lists.

The first part of this section presents comprehensive alphabetical lists for Landscapes, Landforms, Microfeatures, and Anthropogenic Features. The second part of this section groups related terms into subsets of *Geomorphic Environment* or *Other Groupings* as an aid for locating related terms or appropriate contenders. Most of these subsets are based upon a common process of origin (i.e. *Geomorphic Environment*). Consequently, if the origin of a landform is known or can be inferred, a “short” list of appropriate terms can be quickly reviewed. One need not search through a long "master" list containing numerous, unrelated terms. **Note:** The lists are neither mutually exclusive nor a rigid hierarchical classification system. Some land features occur in more than one Geomorphic Process environment, or occur at more than one scale (e.g. *beach* occurs in both “Coastal Marine” and "Lacustrine” geomorphic process environments; *river valley* can occur as either a “Landscape” or as a “Landform”). Generally, terms are found on no more than two lists.

Land features are commonly the result of multiple geomorphic processes. In assigning a landform term to a particular “Geomorphic Environment” list, emphasis is placed upon the dominant, near-surface process(s) evident in soil-forming materials. For example, a *kame* is a landform deposited by glaciofluvial processes and is usually modified by subsequent erosion. However, the dominant influence for the formation and attributes of a *kame* are glacial processes. Therefore, *kame* is included in the *Glacial Environment* list rather than the *Erosional* list.

Grouping terms by Geomorphic Environment places the emphasis on the agents, processes, and materials responsible for the formation of the landform. For example, a sand dune which occurs on a stream terrace is of eolian origin (the dominant agent is wind); dunes are listed with Eolian landforms. Fluvial processes may have provided the sand from which the dune was constructed and the underlying structure upon which it rests (stream terrace - a Fluvial-process landform), but eolian processes are responsible for the landform of primary pedological interest.

Unfortunately, not all surface features can be adequately grouped by Geomorphic Environment. Therefore, some additional groupings have been included. For example, a group is included for "Depressional" features. Obviously, "Depressional" is not a process. The land features in this category share a common attribute (they are all low areas or declivities), but were not all formed by the same processes. The features within each “Other Grouping” share a common setting or context, similar attributes or land use concerns rather than a common geological origin.

If you don't find a desired or adequate term in a particular *Geomorphic Environment* or *Other Group*, review other subset lists.

PART II : GEOMORPHIC DESCRIPTION (Outline)

I) COMPREHENSIVE LISTS:

A) LANDSCAPES (broad or unique groups or clusters of spatially associated features).

B) LANDFORMS (discrete, natural, individual features mappable at common survey scales).

C) MICROFEATURES (discrete, natural, individual features typically too small to delineate at common survey scales).

D) ANTHROPOGENIC FEATURES [discrete, artificial *(human-made **or extensively modified**)*, **earth** surface features].

II) GEOMORPHIC ENVIRONMENTS and OTHER GROUPINGS:

Landscape, Landform, and Microfeature terms grouped by process or common settings.
Lists are <u>not</u> mutually exclusive: some features occur in more than one grouping.

Environments

1. **Coastal Marine and Estuarine** (wave, tidal, or shallow marine related)
2. **Lacustrine** (related to inland water bodies)
3. **Fluvial** [related to concentrated channel flow (e.g. stream)]
4. **Solution** (dominated by dissolution and subsurface drainage)
5. **Eolian** (wind dominated)
6. **Glacial** (directly related to glaciers)
7. **Periglacial** (related to non-glacial, cold climate)
8. **Mass Movement** (gravity dominated)
9. **Volcanic and Hydrothermal**
10. **Tectonic and Structural** (bedrock structures, crustal movement)

Other

11. **Slope** (generic slope forms, geometry, or arrangement rather than process)
12. **Erosional** (dominated by non-channel, non-perennial water erosion)
13. **Depressional** (low area or declivity terms, excludes permanent water bodies)
14. **Wetlands** (related to vegetated or shallow wet areas, wet soils)
15. **Water Bodies** (permanent water features)
16. **Subaqueous Features** (submerged features generally capable of supporting rooted, emergent plants, and adjacent features)

PART II : GEOMORPHIC DESCRIPTION

[Codes: Conventionally, the entire land-feature term is used (e.g. dune field). Some data storage programs (e.g., PEDON 3.6, NASIS) have shorthand codes developed for some terms. An italicized code follows each term, if available, (e.g., meander belt *MB*) ; shown for historical purposes.]

I) COMPREHENSIVE LISTS (Landscapes, Landforms, Microfeatures, and Anthropogenic Features).

A) LANDSCAPES (broad and/or unique groups of spatially associated landforms.)

alluvial plain --
alluvial plain remnant --
badlands *BA*
bajada (also Landform) *BJ*
basin *BS*
basin floor (also Landform) --
bay [coast] (water body; also Landform) --
batholith --
bolson *BO*
breaks *BK*
canyonlands --
coastal plain (also Landform) *CP*
cockpit karst --
cone karst --
continental glacier --
delta plain (also Landform) --
drumlin field --
dune field (also Landform) --
estuary (water body; also Landform) --
everglades --
fan piedmont (also Landform) *FP*
fault-block mountains --
fluviokarst --
fluviomarine terrace (also Landform)--
foothills *FH*
glaciokarst --
gulf (water body; also Landform) --
hills (singular = Landform) *HI*
ice-margin complex --
intermontane basin (also Landform) *IB*
island (also Landform) --
karst *KP*
kegel karst --
lagoon [coast] (water body; also Landform) --
lake plain (also Landform) --
lava field (also Landform) --
lava plain (also Landform) --
lava plateau (also Landform) *LL*
lowland --
marine terrace (also Landform) --
meander belt *MB*
mountain range --
mountains (singular = Landform) *MO*
mountain system --
ocean (water body) --
outwash plain (also Landform) --
peninsula --
piedmont *PI*
piedmont slope --
plains (also Landform) *PL*
plateau (also Landform) *PT*
rift valley --
river valley (also Landform) *RV*
sandhills *SH*
sand plain --
scabland *SC*
sea (water body; also Landform) --
semi-bolson *SB*
shore complex --
sinkhole karst --
sound (water body; also Landform) --
strait (water body; also Landform) --
tableland *TB*
thermokarst *TK*
till plain (also Landform) *TP*
tower karst --
upland *UP*
valley (also Landform) *VA*
volcanic field (also Landform) --

B) LANDFORMS (discrete, natural, individual earth-surface features mappable at common survey scales).

`a`a lava flow	--	butte	*BU*
alas	*AA*	caldera	*CD*
alluvial cone	--	canyon	*CA*
alluvial fan	*AF*	canyon bench	--
alluvial flat	*AP*	canyon wall	--
alpine glacier	--	Carolina Bay	*CB*
anticline	*AN*	channel (also Microfeature)	*CC*
arete	*AR*	chenier	*CG*
arroyo	*AY*	chenier plain	*CH*
ash flow	*AS*	cinder cone	*CI*
atoll	*AT*	cirque	*CQ*
avalanche chute	*AL*	cirque floor	--
axial stream	--	cirque headwall	--
back-barrier beach	--	cirque platform	--
back-barrier flat	--	cliff	*CJ*
backshore	*AZ*	climbing dune	--
backswamp	*BS*	closed depression (also Micro.)	--
bajada (also Landscape)	*BJ*	coastal plain (also Landscape)	*CP*
ballena	*BL*	cockpit	--
ballon	*BV*	col	*CL*
bar	*BR*	collapsed ice-floored lakebed	*CK*
barchan dune	*BQ*	collapsed ice-walled lakebed	*CN*
barrier beach	*BB*	collapsed lake plain	*CS*
barrier cove	--	collapsed outwash plain	*CT*
barrier flat	*BF*	collapse sinkhole	--
barrier island	*BI*	complex landslide	--
basin floor (also Landscape)	*BC*	coral island	--
basin-floor remnant	*BD*	coulee	*CE*
bay [coast] (water body; also Landscape)	*WB*	cove [coast] (water body)	--
		cove [geom]	*CO*
bay [geom.]	--	crag and tail	--
bay bottom	--	crater [volcanic]	*CR*
bayou (water body)	*WC*	crevasse filling	*CF*
beach	*BE*	cuesta	*CU*
beach plain	*BP*	cuesta valley	--
beach ridge	*BG*	cutoff	*CV*
beach terrace	*BT*	debris avalanche	*DA*
berm	*BM*	debris fall	--
beveled base	--	debris flow	*DF*
blind valley	*VB*	debris slide	--
block field	*BW*	debris spread	--
block glide	--	debris topple	--
block lava flow	--	deflation basin	*DB*
block stream	*BX*	deflation flat	--
blowout	*BY*	delta	*DE*
bluff	*BN*	delta plain (also Landscape)	*DC*
bog	*BO*	depression	*DP*
box canyon	--	diapir	*DD*
braided stream	*BZ*	diatreme	--
broad interstream divide	--	dike	*DK*

dipslope *DL*
disintegration moraine *DM*
divide *DN*
dome *DO*
drainhead complex -
drainageway *DQ*
draw *DW*
drumlin *DR*
drumlinoid ridge --
dune *DU*
dune field (also Landscape) --
dune lake (water body) --
dune slack (also micro) --
earth flow *EF*
earth spread --
earth topple --
end moraine *EM*
ephemeral stream (also Microfeature)--
eroded fan remnant --
eroded fan-remnant sideslope --
erosion remnant *ER*
escarpment *ES*
esker *EK*
estuary (water body; also Landscape) *WD*
faceted spur *FS*
fall (also material) *FB*
falling dune --
fan *FC*
fan apron *FA*
fan collar --
fanhead trench *FF*
fan piedmont (also Landscape) *FG*
fan remnant *FH*
fan skirt *FI*
fault block --
fault-line scarp *FK*
fault zone --
fen *FN*
fissure vent --
fjord (water body) *FJ*
flat *FL*
flatwoods --
flood-tidal delta --
flood-tidal delta flat --
flood-tidal delta slope --
flood plain *FP*
flood-plain playa *FY*
flood-plain splay *FM*
flood-plain step *FO*
flow --
flute (also Microfeature) *FU*
fluviomarine bottom --
fluviomarine terrace (also Landscape)-
fold *FQ*
foredune *FD*
fosse *FV*
free face *FW*
fringe-tidal marsh --
gap *GA*
geyser --
geyser basin --
geyser cone --
giant ripple *GC*
glacial drainage channel *GD*
glacial lake (water body) *WE*
glacial lake [relict] *GL*
glacial-valley floor --
glacial-valley wall --
glacier --
gorge *GO*
graben *GR*
ground moraine *GM*
gulch *GT*
gulf [coast] (water body; also Landscape) --
gut [stream] (water body) *WH*
gut (valley) *GV*
half-graben --
hanging valley *HV*
headland *HE*
head-of-outwash --
headwall *HW*
high hill --
highmoor bog *HB*
hill *HI*
hillslope --
hogback *HO*
homoclinal ridge --
horn *HR*
horst *HT*
hot spring --
ice-contact slope --
ice-marginal stream --
ice-pushed ridge --
inlet --
inselberg *IN*
inset fan *IF*
interdrumlin --
interdune (also Microfeature) *ID*
interfluve (also Geom. Component - Hills) *IV*
interior valley --
intermittent stream (also Microfeature)--
intermontane basin (also Landscape)*IB*
island (also Landscape) --
kame *KA*
kame moraine *KM*
kame terrace *KT*

karst cone --
karstic marine terrace --
karst lake --
karst tower --
karst valley --
kettle *KE*
kipuka --
knob *KN*
knoll *KL*
lagoon [coast] (water body; also Landscape) *WI*
lagoon bottom --
lagoon channel --
lahar *LA*
lake (water body) *WJ*
lakebed [relict] *LB*
lake plain (also Landscape) *LP*
lakeshore *LF*
lake terrace *LT*
landslide *LK*
lateral moraine *LM*
lateral spread --
lava field (also Landscape) --
lava flow *LC*
lava flow unit (also Microfeature) --
lava plain (also Landscape) *LN*
lava plateau (also Landscape) *LL*
lava trench (also Microfeature) --
lava tube --
ledge *LE*
levee [streams] *LV*
loess bluff *LO*
loess hill *LQ*
longitudinal dune --
longshore bar [relict] *LR*
louderback *LU*
low hill --
lowmoor bog *LX*
maar --
mainland cove --
main scarp (also Microfeature) --
mangrove swamp --
marine lake --
marine terrace (also Landscape) *MT*
marsh *MA*
mawae --
meander *MB*
meandering channel *MC*
meander scar *MS*
meander scroll *MG*
medial moraine *MH*
mesa *ME*
meteorite crater --
mogote --
monadnock *MD*
monocline *MJ*
moraine *MU*
mountain (plural = Landscape) *MM*
mountain slope *MN*
mountain valley *MV*
mud flat *MF*
mudflow *MW*
mud pot --
muskeg *MX*
natural levee *NL*
neck [volcanic] --
notch *NO*
nunatak *NU*
open depression (also Microfeature) --
outwash delta --
outwash fan *OF*
outwash plain (also Landscape) *OP*
outwash terrace *OT*
overflow stream channel --
oxbow *OX*
oxbow lake (water body) *WK*
oxbow lake (ephemeral) *OL*
paha *PA*
pahoehoe lava flow --
paleoterrace --
parabolic dune *PB*
parna dune *PD*
partial ballena *PF*
patterned ground *PG*
pavement karst --
peak *PK*
peat plateau *PJ*
pediment *PE*
perennial stream (water body) --
pillow lava flow --
pinnacle --
pingo *PI*
pitted outwash plain *PM*
pitted outwash terrace --
plain (also Landscape) *PN*
plateau (also Landscape) *PT*
playa *PL*
playa dune (also Mircofeature) --
playa floor (also Mircofeature) --
playa lake (water body) *WL*
playa rim (also Mircofeature) --
playa slope (also Mircofeature) --
playa step (also Mircofeature) --
plug [volcanic] --
plug dome *PP*
pluvial lake (water body) *WM*
pluvial lake (relict) *PQ*

pocosin *PO*
point bar *PR*
point bar [coastal] --
pothole (also Microfeature) *PH*
pothole lake (water body) *WN*
pressure ridge [ice] --
pressure ridge [volcanic] *PU*
proglacial lake (water body) *WO*
proglacial lake [relict] --
pyroclastic flow --
pyroclastic surge --
raised beach *RA*
raised bog *RB*
ravine *RV*
recessional moraine *RM*
reef *RF*
relict-tidal inlet (water body)--
reworked lake plain --
ribbed fen *RG*
ridge *RI*
rim *RJ*
river (water body) --
river valley (also Landscape) --
roche moutonnée(also Microfeature)*RN*
rock fall (also Microfeature) --
rockfall avalanche --
rock glacier *RO*
rock pediment --
rock spread --
rock topple --
rotational debris slide --
rotational earth slide --
rotational rock slide --
rotational slide *RP*
saddle *SA*
sag (also Microfeature) --
sag pond (water body, also Microfeature) --
salt marsh *SM*
salt pond (water body; also Microfeature) *WQ*
sand flow *RW*
sand ramp --
sand sheet *RX*
scarp *RY*
scarp slope *RS*
scree slope --
sea (water body; also Landscape) --
sea cliff *RZ*
seep (also Microfeature) --
seif dune *SD*
semi-open depression (also Microfeature) --
shield volcano --
shoal (water body) *WR*
shoal (relict) *SE*
shore --
shrub-coppice dune (Micro. only) *SG*
sill *RT*
sinkhole *SH*
slackwater (water body) *WS*
slick rock (also Microfeature) --
slide *SJ*
slot canyon --
slough (ephemeral water) *SL*
slough (permanent water) *WU*
slump *SK*
slump block *SN*
snowfield --
soil fall --
solution platform --
solution sinkhole --
sound (water body; also Landscape) --
spit *SP*
spur *SQ*
stack [coast] --
stack [geom] *SR*
star dune --
steptoe *ST*
stock --
stoss and lee --
strait (water body; also Landscape) --
strand plain *SS*
strath terrace *SU*
stratovolcano *SV*
stream (water body) --
stream terrace *SX*
strike valley --
string bog *SY*
structural bench *SB*
submerged back-barrier beach --
submerged mainland beach --
submerged point bar [coastal] --
submerged-upland tidal marsh --
submerged wave-built terrace --
submerged wave-cut platform --
swale (also Microfeature) *SC*
swallow hole *TB*
swamp *SW*
syncline *SZ*
talus cone --
talus slope --
tarn (water body; also Microfeature) --
terminal moraine *TA*
terrace *TE*
thermokarst depression *TK*
thermokarst lake (water body) *W V*
tidal flat *TF*

tidal inlet --
tidal marsh --
till-floored lake plain --
till plain (also Landscape) *TP*
toe [mass movement] (also Microfeature) --
tombolo *TO*
topple --
tor *TQ*
Toreva block --
translational debris slide --
translational earth slide --
translational rock slide --
translational slide *TS*
transverse dune *TD*
trough *TR*
tunnel valley *TV*
tunnel-valley lake (water body) --
underfit stream --
U-shaped valley *UV*
valley *VA*
valley border surfaces --
valley flat *VF*
valley floor *VL*
valley floor remnant --
valley side *VS*
valley train *VT*
volcanic cone *VC*
volcanic dome *VD*
volcanic field (also Landscape) --
volcano *VO*
V-shaped valley *V V*
wash *WA*
washover fan *WF*
washover-fan flat --
washover-fan slope --
wave-built terrace *WT*
wave-cut platform *WP*
wind gap *WG*
window --
wind-tidal flat --
yardang (also Microfeature) --
yardang trough (also Microfeature) --

C) MICROFEATURES (discrete, natural, earth-surface features typically too small to delineate at common survey scales).

bar --
channel (also Landform) --
closed depression (also Landform) --
corda --
cutter --
dune slack (also Landform) --
dune traces --
earth pillar --
ephemeral stream (also Landform)
finger ridge --
flute (also Landform) --
frost boil --
glacial groove --
groove --
gully --
hillock --
hoodoo --
interdune (also Landform) --
intermittent stream (water body; also Landform) --
karren --
lava flow unit (also Landform) --
lava trench (also Landform) --
main scarp (also Landform) --
minor scarp --
mound *M*
nivation hollow --
open depression (also Landform) --
patterned ground Microfeatures *(see below; used in association with landform "patterned ground"* *PG*

a) ***Periglacial*** "**patterned ground**" Microfeatures:

circle --
earth hummocks --
high-center polygons --
ice wedge polygons --
low-center polygons --
non-sorted circles --
palsa (palsen =*plural*) (= peat hummocks) --
polygons --
sorted circles --
stripes --
turf hummocks --

b) ***Other*** "**patterned ground**" Microfeatures:

bar and channel --
circular gilgai --
elliptical gilgai --
gilgai *G*
hummocks --
linear gilgai --
mima mounds --
pimple mounds --

perennial stream (water body; also LF)-
pinnacle --
playa dune (also Landform) --
playa floor (also Landform) --
playa rim (also Landform) --
playa slope (also Landform) --
playa step (also Landform) --
playette --
pond (water body) --
pool (water body) --
pothole (also Landform) --
pressure ridge [volcanic] (also LF)--
rib --
rill --
ripple mark --
roche moutonnée (also Landform) --
sag (also Landform) --
sag pond (water body; also Landform) --
salt pond (water body; also Landform) --
sand boil --
scour (mark) --
seep (also Landform) --
semi-open depression (also Landform) --
shoreline --
shrub-coppice dune *SG*
slick rock (also Landform) --
slip face --
solifluction lobe --
solifluction sheet --
solifluction terrace --
solution chimney --
solution corridor --
solution fissure --
solution pipe --
spatter cone --
spiracle --
strandline --
swale (also Landform) --
swash zone --
tank (water body) --
tarn (water body; also Landform) --

terracettes *T*
toe [mass move.] (also Landform) **--**
tree-tip mound --
tree-tip pit --
truncated soil --
tumulus (tumuli = plural) --
--

vernal pool (seasonal water body) --
yardang (also Landform) --
yardang trough (also Landform) --
zibar

D) ANTHROPOGENIC FEATURES [discrete, artificial (human-made or extensively modified), earth surface features].

artificial collapsed depression *G*
artificial levee *A*
beveled cut --
borrow pit --
burial mound *B*
cut *(road, railroad)* --
cutbank --
ditch --
dredged channel --
dredge-deposit shoal --
dredge spoil bank --
dump --
fill --
filled marshland --
floodway --
gravel pit --
impact crater --
landfill (*see sanitary landfill*)
leveled land --
log landing --
midden *H*
openpit mine --
pond *(human-made)* --
quarry --
railroad bed *D*
reclaimed land --
rice paddy *E*
road bed *I*
road cut --
sand pit --
sanitary landfill --
scalped area --
sewage lagoon --
skid trail --
spoil bank --
spoil pile --
surface mine --
tillage / management features *F*
(see common, more specific types in following list)

Tillage / Management features (common types) :

conservation terrace (*modern*) --
double-bedding mound --
(i.e. bedding mound for timber; lower Coastal Plain)
drainage ditch --
furrow --
hillslope terrace --
(e.g. archeological features; China, Peru)
inter-furrow --

truncated soil --
urban land --

II) GEOMORPHIC PROCESS or OTHER GROUPINGS (Landscape, Landform, and Microfeature terms grouped by "geomorphic process" (e.g. *Fluvial*) or geomorphic setting (e.g. *Water Bodies*). Lists are not mutually exclusive; some terms occur in more than one group.)

1. COASTAL MARINE AND ESTUARINE (wave or tidal control or near-shore / shallow submarine).

Landscapes:

bay [coast] (water body; also Landform)
coastal plain (also Landform) --
estuary (water body; also Landform) --
fluviomarine terrace (also Landform) --
island (also Landform) --
lagoon [coast] (water body; also Landform)
lowland --
marine terrace (also Landform) --
peninsula --
shore complex

Landforms:

atoll	*AT*
back-barrier beach	--
back-barrier flat	--
backshore	*AZ*
bar	*BR*
barrier beach	*BB*
barrier cove	--
barrier flat	*BF*
barrier island	*BI*
bay [coast] (water body; also Landscape)	*WB*
bay bottom	--
beach	*BE*
beach plain	*BP*
beach ridge	*BG*
beach terrace	*BT*
berm	*BM*
bluff	*BN*
chenier	*CG*
chenier plain	*CH*
coastal plain (also Landscape)	*CP*
coral island	--
cove [coast] (water body)	--
delta	*DE*
delta plain (also Landscape)	*DC*
drainhead complex	-
flat	*FL*
flatwoods	--
fluviomarine terrace (also Landscape)	--
foredune	*FD*
fringe-tidal marsh	--
headland	*HE*
island (also Landscape)	--
lagoon [relict]	*WI*
lagoon (water body)	--
longshore bar [relict]	*LR*
mangrove swamp	--
marine lake	--
marine terrace (also Landscape)	*MT*
mud flat	*MF*
point bar [coastal]	--
raised beach	*RA*
reef	*RF*
salt marsh	*SM*
sea cliff	*RZ*
shoal (relict)	*SE*
shore	--
spit	*SP*
stack [coast]	--
strand plain	*SS*
submerged-upland tidal marsh	--
tidal flat	*TF*
tidal marsh	--
tombolo	*TO*
washover fan	*WF*
wave-built terrace	*WT*
wave-cut platform	*WP*
wind-tidal flat	--

Microfeatures:

ripple mark --
shoreline --
swash zone --

2. LACUSTRINE (related to inland water bodies).

Landscapes:

bay [coast] (water body; also Landform)	--
island (also Landform)	--
lake plain (also Landform)	--
peninsula	--
shore complex	--

Landforms:

backshore	*AZ*
bar	*BR*
barrier beach	*BB*
barrier flat	*BF*
barrier island	*BI*
bay [coast] (water body; also Landform)	--
beach	*BE*
beach plain	*BP*
beach ridge	*BG*
beach terrace	*BT*
berm	*BM*
bluff	*BN*
delta	*DE*
delta plain (also Landscape)	*DC*
flat	*FL*
flood-plain playa	*FY*
foredune	*FD*
headland	*HE*
island (also Landscape)	--
karst lake	--
lagoon [relict]	*WI*
lakebed [relict]	*LB*
lakebed (water body)	*LB*
lake plain (also Landscape)	*LP*
lake terrace	*LT*
longshore bar [relict]	*LR*
mud flat	*MF*
oxbow lake (ephemeral)	*OL*
playa	*PL*
playa floor (also Microfeature)	--
playa rim (also Microfeature)	--
playa slope (also Microfeature)	--
playa step (also Microfeature)	--
pluvial lake (relict)	*PQ*
raised beach	*RA*
reworked lake plain	--
salt marsh	*SM*
shoal (relict)	*SE*
shore	--
spit	*SP*
stack [coast]	--
strand plain	*SS*
till-floored lake plain	--
tombolo	*TO*
wave-built terrace	*WT*
wave-cut platform	*WP*

Microfeatures:

bar	--
playa floor (also Landform)	--
playa rim (also Landform)	--
playa slope (also Landform)	--
playa step (also Landform)	--
playette	--
ripple mark	--
shoreline	--
strandline	--
swash zone	--
vernal pool	--

3. FLUVIAL [dominantly related to concentrated water flow (channel flow); includes erosional and depositional features, but excluding glaciofluvial landforms (see *Glacial*) and permanent water features (e.g. river; see *Water Bodies*)].

Landscapes:

alluvial plain	--	delta plain	--
alluvial plain remnant	--	fan piedmont	*FP*
badlands	*BA*	meander belt	*MB*
bajada	*BJ*	river valley (also Landform)	--
breaks	*BK*	scabland	*SC*
canyonlands	--		

Landforms:

alluvial cone	--	flood-plain playa	*FY*
alluvial fan	*AF*	flood-plain splay	*FM*
alluvial flat	*AP*	flood-plain step	*FO*
arroyo	*AY*	giant ripple	*GC*
axial stream (water body)	--	gorge	*GO*
backswamp	*BS*	gulch	*GT*
bajada	*BJ*	gut (valley)	*GV*
bar	*BR*	inset fan	*IF*
basin-floor remnant	*BD*	intermittent stream (also Microfeature)	-
block stream	*BX*	levee [streams]	*LV*
box canyon	--	meander scar	*MS*
braided stream	*BZ*	meander scroll	*MG*
canyon	*CA*	natural levee	*NL*
channel	*CC*	overflow stream channel	--
coulee	*CE*	oxbow	*OX*
cutoff	*CV*	oxbow lake (ephemeral)	*OL*
delta	*DE*	paleoterrace	--
delta plain (also Landscape)	*DC*	point bar	*PR*
drainageway	*DQ*	ravine	*RV*
drainhead complex	-	river valley (also Landscape)	--
draw	*DW*	slot canyon	--
ephemeral stream (also Microfeature)	--	strath terrace	*SU*
fan apron	--	stream terrace	*SX*
fan collar	--	valley border surfaces	--
fanhead trench	*FF*	valley flat	--
fan remnant	--	valley floor remnant	--
fan skirt	*FI*	wash	*WA*
flood plain	*FP*	wind gap	*WG*

Microfeatures:

bar	--	gully	--
bar & channel (patterned ground)	--	intermittent stream (also Landform)	--
channel	--	ripple mark	--
ephemeral stream (also Landform)	--	swash zone	--
groove	--		

4. SOLUTION (dominated by dissolution, and commonly, subsurface drainage).

Landscapes:

cockpit karst	--	kegel karst	--
cone karst	--	sinkhole karst	--
fluviokarst	--	thermokarst	*TK*
glaciokarst	--	tower karst	--
karst	*KP*		

Landforms:

blind valley	*VB*	pavement karst	--
cockpit	--	pinnacle	--
collapse sinkhole	--	sinkhole	*SH*
interior valley	--	solution platform	--
karst cone	--	solution sinkhole	--
karstic marine terrace	--	swallow hole	*TB*
karst lake	--	thermokarst depression (also Microfeature)	*TK*
karst tower	--	yardang (also Microfeature)	--
karst valley	--	yardang trough (also Microfeature)	--
mogote	--		

Microfeatures:

cutter	--	solution pipe	--
karren	--	thermokarst depression	--
solution chimney	--	yardang (also Landform)	--
solution corridor	--	yardang trough (also Landform)	--
solution fissure	--		

5. EOLIAN

6. GLACIAL (directly related to glaciers; includes glaciofluvial, glaciolacustrine, glaciomarine and outwash features).

Landscapes:

continental glacier	--	ice-margin complex	--
drumlin field	--	outwash plain (also Landform)	--
glaciokarst	--	till plain (also Landform)	*TP*
hills	*HI*		

Landforms:

alpine glacier	--	kame	*KA*
arete	*AR*	kame moraine	*KM*
cirque	*CQ*	kame terrace	*KT*
cirque floor	--	kettle	*KE*
cirque headwall	--	lateral moraine	*LM*
cirque platform	--	medial moraine	*MH*
col	*CL*	moraine	*MU*
collapsed ice-floored lakebed	*CK*	nunatak	*NU*
collapsed ice-walled lakebed	*CN*	outwash delta	--
collapsed lake plain	*CS*	outwash fan	*OF*
collapsed outwash plain	*CT*	outwash plain (also Landscape)	*OP*
crag and tail	--	outwash terrace	*OT*
crevasse filling	*CF*	paha	--
disintegration moraine	*DM*	pitted outwash plain	*PM*
drumlin	*DR*	pitted outwash terrace	--
drumlinoid ridge	--	pothole (also Microfeature)	*PH*
end moraine	*EM*	pressure ridge [ice]	--
esker	*EK*	proglacial lake [relict]	--
fjord (water body)	--	proglacial lake (water body)	--
flute (also Microfeature)	*FU*	recessional moraine	*RM*
fosse	*FV*	reworked lake plain	--
giant ripple	*GC*	roche moutonnée (also Micro.)	*RN*
glacial drainage channel	*GD*	rock glacier	*RO*
glacial lake [relict]	*GL*	snowfield	--
glacial lake (water body)	--	stoss and lee	--
glacial-valley floor	--	tarn (water body; also Microfeature)	--
glacial-valley wall	--	terminal moraine	*TA*
glacier	--	till-floored lake plain	--
ground moraine	*GM*	till plain (also Landscape)	*TP*
hanging valley	*HV*	tunnel valley	*TV*
head-of-outwash	--	tunnel-valley lake (water body)	--
ice-contact slope	--	underfit stream	--
ice-marginal stream (water body)		U - shaped valley	*UV*
ice-pushed ridge	--	valley train	*VT*
interdrumlin	--		

Microfeatures:

glacial groove	--	roche moutonnée (also Landform)	--
flute (also Landform)	--	swale (also LF)	--
nivation hollow	--	tarn (water body; also “Landform”)	--
pothole (also Landform)	--		

7. PERIGLACIAL [related to non-glacial, cold climate (modern or relict), and periglacial forms of patterned ground. Note: consider "patterned ground" as a "Landform", but treat specific types of patterned ground, singular or plural, as Microfeatures.]

Landscapes:

coastal plain (*e.g. North Slope*)	*CP*	plains	*PL*
hills	*HI*	thermokarst	*TK*

Landforms:

alas	*AA*	pingo	*PI*
block field	*BW*	rock glacier	*RO*
muskeg	*MX*	string bog	*SY*
patterned ground	*PG*	thermokarst depression	*TK*
(see Microfeatures below for types)		thermokarst lake (water body)	--
peat plateau	*PP*		

Microfeatures:

circle	--		
earth hummocks	--	polygon	--
frost boil	--	solifluction lobe	--
high-center polygons	--	solifluction sheet	--
ice wedge polygons	--	solifluction terrace	--
low-center polygons	--	sorted circles	--
nivation hollow	--	stripes	--
non-sorted circles	--	turf hummocks	--
palsa (palsen = *plural* ; = peat hummocks)	--		

8. MASS MOVEMENT (= **MASS WASTING**) (dominated by gravity, including "creep" forms; *see* Mass Movement Types table).

Landscapes: (these generic Landscapes are not Mass Movement features per say, but are modified by, and include localized areas of, Mass Movement)

foothills	*FH*	mountains	*MO*
hills	*HI*		
mountain range	--		

Landforms:

ash flow	*AS*	rock spread	--
avalanche chute	*AL*	rock topple	--
block glide	--	rotational debris slide	--
block stream	*BX*	rotational earth slide	--
complex landslide	--	rotational rock slide	--
creep	--	rotational slide	*RP*
debris avalanche	--	sag (also Microfeature)	--
debris fall	--	sag pond (water body; also Micro.)	
debris flow	*DF*	sand flow	*RW*
debris slide	--	scree slope	--
debris spread	--	slide	*SJ*
debris topple	--	slump	*SK*
earth flow	*EF*	slump block	*SN*
earth spread	--	soil fall	--
earth topple	--	talus cone	--
fall	*FB*	talus slope	--
flow	--	toe [mass move.] (also Micro.)	--
lahar	*LA*	topple	--
landslide	*LK*	Toreva block	--
lateral spread	--	translational debris slide	--
main scarp (also Microfeature)	--	translational earth slide	--
mudflow	*MW*	translational rock slide	--
rock fall (also Microfeature)	--	translational slide	*TS*
rockfall avalanche	--		

Microfeatures:

main scarp (also Landform)	--	solifluction lobe	--
minor scarp	--	solifluction sheet	--
rock fall (also Landform)	--	solifluction terrace	--
sag (also Landform)	--	terracettes	*T*
sag pond (w; also Landform)	--	toe [mass move.] (also Landform)	--
sand boil	--		

9. VOLCANIC and HYDROTHERMAL

Landscapes:

foothills	*FH*	lava plateau (also Landform)	--
hills	*HI*	mountains	*MO*
lava field (also Landform)	--	volcanic field (also Landform)	--
lava plain (also Landform)	--		

Landforms:

`a`a lava flow	--	lava tube	--
ash flow	*AS*	louderback	*LU*
block lava flow	--	maar	--
caldera	*CD*	mawae	--
cinder cone	*CI*	mud pot	--
crater [volcanic]	*CR*	neck [volcanic]	--
diatreme	--	pahoehoe lava flow	--
fissure vent	--	pillow lava flow	--
geyser	--	plug [volcanic]	--
geyser basin	--	plug dome	*PP*
geyser cone	--	pressure ridge [volcanic] ; (also Microfeature)	*PU*
hot spring	--	pyroclastic flow	--
kipuka	--	pyroclastic surge	--
lahar	*LA*	shield volcano	--
lava field (also Landscape)	--	steptoe	*ST*
lava flow unit (also Microfeature)	--	stratovolcano	*SV*
lava flow	*LC*	volcanic cone	*VC*
lava plain (also Landscape)	*LN*	volcanic dome	*VD*
lava plateau (also Landscape)	*LL*	volcanic field (also Landscape)	--
lava trench (also Microfeature)	--		

Microfeatures:

corda	--	spatter cone	--
lava flow unit (also Landform)	--	spiracle	--
lava trench (also Landform)	--	tumulus (tumuli = plural)	--
pressure ridge [volc.] ; (also Landform)	--		

10. TECTONIC and STRUCTURAL (related to regional and local bedrock structures, or crustal movement. In Soil Survey, structural and tectonic features are only recognized if they have some expression at or near the land surface).

Landscapes:

batholith	--	mountains	*MO*
bolson	*BO*	mountain system	--
fault-block mountains	--	plateau	*PT*
foothills	*FH*	rift valley	--
hills	*HI*	semi-bolson	*SB*
intermontane basin	*IB*	tableland	*TB*
mountain range	--	valley	*VA*

Landforms:

anticline	*AN*	hogback	*HO*
canyon bench	--	homoclinal ridge	--
cuesta	*CU*	horst	*HT*
cuesta valley	--	louderback	*LU*
diapir	*DD*	meteorite crater	--
dike	*DK*	monocline	*MJ*
dipslope	*DL*	scarp slope	*RS*
dome	*DO*	sill	--
fault block	--	stock	--
fault-line scarp	*FK*	strike valley	--
fault zone	--	structural bench	*SB*
fold	*FQ*	syncline	*SZ*
graben	*GR*	window	--
half-graben	--		

Microfeatures:

sand boil	--

11. SLOPE (generic terms (e.g. hill) or those that describe slope form, geometry, or arrangement of land features, rather than any particular genesis or process).

Landscapes:

badlands	*BA*	mountains	*MO*
breaks	*BK*	mountain system	--
canyonlands	--	piedmont	*PI*
fault-block mountains	--	piedmont slope	--
foothills	*FH*	plateau (also Landform)	*PT*
hills	*HI*	tableland	*TB*
mountain range	--	upland	*UP*

Landforms:

beveled base	--	mesa	*ME*
block stream	*BX*	mountain (plural = Landscape)	*MM*
bluff	*BN*	mountain slope	*MN*
broad interstream divide	--	mountain valley	*MV*
butte	*BU*	notch	*NO*
canyon bench	--	paha	*PA*
canyon wall	--	peak	*PK*
cliff	*CJ*	pediment	*PE*
cuesta	*CU*	plain (also Landscape)	*PN*
dome	*DO*	plateau (also Landscape)	*PT*
escarpment	*ES*	ridge	*RI*
faceted spur	*FS*	rim	*RJ*
fault-line scarp	*FK*	rock pediment	--
free face (also Geom. Comp. – Hills, Mountains)	*FW*	scarp	*RY*
gap	*GA*	scarp slope	--
headwall	*HW*	scree slope	--
high hill	--	slick rock (also Microfeature)	--
hill (plural = Landscape)	*HI*	spur	*SQ*
hillslope	--	stack [geom]	*SR*
hogback	*HO*	talus cone	--
interfluve (also Geom. Component - Hills)	*IV*	talus slope	--
knob	*KN*	tor	*TQ*
knoll	*KL*	valley	*VA*
ledge	*LE*	valley floor remnant	--
low hill	--	wind gap	*WG*

Microfeatures:

finger ridge	--	rill	--
mound	*M*	slick rock (also Landform)	--
rib	--		

12. EROSIONAL (related dominantly to water erosion but excluding perennial, concentrated channel flow (i.e. fluvial, glaciofluvial), or eolian erosion).

Landscapes:

badlands	*BA*	mountains	*MO*
breaks	*BK*	piedmont	*PI*
canyonlands	--	piedmont slope	--
foothills	*FH*	plateau (also Landform)	*PT*
hills	*HI*	tableland	*TB*
mountain range	--		

Landforms:

ballena	*BL*	paha	*PA*
ballon	*BV*	partial ballena	*PF*
basin floor remnant	*BD*	peak	*PK*
beveled base	--	pediment	*PE*
canyon bench	--	plateau (also Landscape)	*PT*
canyon wall	--	rock pediment	--
col	*CL*	saddle	*SA*
cuesta	*CU*	scarp slope	*RS*
cuesta valley	--	slick rock (also Microfeature)	--
eroded fan remnant	--	stack [geom]	*SR*
eroded fan-remnant sideslope	--	strike valley	--
erosion remnant	*ER*	structural bench	*SB*
free face (also Geom. Component – Hills, Mountains)	*FW*	tor	*TQ*
gap	*GA*	valley border surfaces	--
hogback	*HO*	valley floor remnant	--
inselberg	*IN*	wind gap	*WG*
monadnock	*MD*	window	--
notch	*NO*		

Microfeatures:

earth pillar	--	pinnacle	--
finger ridge	--	rib	--
groove	--	rill	--
gully	--	slick rock (also Landform)	--
hoodoo	--	swale	--

13. DEPRESSIONAL (low area or declivity features, excluding permanent water bodies).

Landscapes:

basin	*BS*	semi-bolson	*SB*
basin floor (also Landform)	--	valley	*VA*
bolson	*BO*		

Landforms:

alluvial flat	*AP*	open depression (also Microfeature)	--
basin floor(also Landscape)	*BC*	playa	*PL*
basin floor remnant	*BD*	playa floor (also Microfeature)	--
box canyon	--	playa rim (also Microfeature)	--
canyon	*CA*	playa slope (also Microfeature)	--
closed depression (also Microfeature)	--	playa step (also Microfeature)	--
col	*CL*	pothole (also Microfeature)	*PH*
coulee	*CE*	ravine	*RV*
cove [geom.]	*CO*	saddle	*SA*
cuesta valley	--	sag (also Microfeature)	--
depression	*DP*	semi-open depression (also Microfeature)	--
drainageway	*DQ*	slot canyon	--
drainhead complex	-	strike valley	--
gap	*GA*	swale (also Microfeature)	*SC*
gorge	*GO*	trough	*TR*
gulch	*GT*	U-shaped valley	*UV*
gut (valley)	*GV*	valley	*VA*
intermontane basin	*IB*	valley floor	*VL*
kettle	*KE*	V-shaped valley	*V V*
mountain valley	*MV*		

Microfeatures:

closed depression (also Landform)	--	pothole (also Landform)	--
open depression (also Landform)	--	semi-open depression (also Landform)	--
playa floor (also Landform)	--	swale (also Landform)	--
playa rim (also Landform)	--	sag (also Landform)	--
playa slope (also Landform)	--	tree-tip pit	--
playa step (also Landform)	--		
playette	--		

14. WETLANDS [Related to vegetated and / or shallow wet areas, and wet soils. Provisional list: conventional, geologic definitions, not legalistic or regulatory usage].

Landscapes:

everglades --

[Generally, there is no appropriate Landscape term for wetlands; by default, choose most appropriate Landscape term from another Process Environment or Grouping]

Landforms:

alas *AS*
backswamp *BS*
bog *BO*
Carolina Bay *CB*
dune slack (also Microfeature) --
ephemeral stream (also Microfeature) --
estuary *WD*
fen *FN*
flood-plain playa *FY*
fringe tidal marsh --
highmoor bog *HB*
intermittent stream (also Microfeature) --
lowmoor bog *LB*
mangrove swamp --
marsh *MA*
mud flat *MF*
muskeg *MX*
oxbow lake (ephemeral water) *OL*
peat plateau *PJ*
playa (intermittent water) *PL*
pocosin *PO*
pothole (intermittent water) ; (also Microfeature) *PH*
raised bog *RB*
ribbed fen *RG*
salt marsh *SM*
seep (also Microfeature) --
semi-open depression (also Microfeature) --
slough (intermittent water) *SL*
string bog *SY*
swamp *SW*
tidal flat *TF*
tidal marsh --

Microfeatures:

dune slack (also Landform) --
ephemeral stream (also Landform) --
intermittent stream (also Landform) --
playette --
pothole (intermittent water) ; (also Landform) --
seep (also Landform) --
semi-open depression (also Landform) --
vernal pool (seasonal water) --

15. WATER BODIES [Discrete “surface water” features, primarily permanent open water, which in Soil Survey Reports are commonly treated as the generic map unit "water" (e.g. lake), or as a spot / line symbol (e.g. perennial stream)].

Landscapes:

bay [coast] (water body; also Landform) --
estuary (water body; also Landform)--
gulf [coast] (water body; also Landform) --
lagoon [coast] (water body; also Landform) --
ocean (water body) --
sea (water body; also Landscape) --
sound (water body) --
strait (water body) --

Landforms:

axial stream --
bay [coast] (water body; also Landscape) *WB*
bayou *WC*
cove [coast] --
dune lake --
estuary (water body; also Landscape) *WD*
fjord *FJ*
glacial lake *WE*
gut [stream] *WH*
ice-marginal stream --
inlet --
lagoon (water body; also Landscape) *WI*
lagoon channel --
lake *WJ*
marine lake --
oxbow lake *WK*
perennial stream (also Microfeature) --
playa lake *WL*
pluvial lake *WM*
pothole (lake) *WN*
proglacial lake *WO*
relict-tidal inlet (water body) --
river --
sag pond (also Microfeature) --
salt pond (also Microfeature) *WQ*
sea (water body; also Landform) --
shoal *WR*
slackwater *WS*
slough (permanent water) *WU*
stream (permanent water) --
tarn (also Microfeature) --
thermokarst lake *W V*
tidal inlet --
tunnel-valley lake --

Microfeatures:

channel (permanent water) --
perennial stream (also Landform) --
pond --
pool --
pothole (permanent water) ; (also Landform)

pond2 0 0 12 274.32 238.2 0 0 10.02 117 1998 507.2 -- permanent v

16. SUBAQUEOUS FEATURES [Discrete underwater features that commonly can support rooted, emergent plants, and adjacent features, ordinarily found below permanent open water. Historically, in Soil Survey Reports these underwater features have been included in the generic map unit "water"]. **Subaqueous "Landscape" terms are obviously not terrestrial, but are Earth surface features.**

Landscapes:

bay [coast] (also Landform) --
gulf [coast] --
estuary (also Landform) --
lagoon [coast] (also Landform) --
ocean --
sea (also Landform) --
sound (also Landform) --
strait (also Landform) --

Landforms:

barrier cove --
bay [coast] (also Landscape) --
bay bottom --
cove [coast] --
dredged channel *(Anthropogenic Feature)* --
dredge-deposit shoal *(Anthropogenic Feature)* --
estuary (also Landscape) *WD*
flood-tidal delta --
flood-tidal delta flat --
flood-tidal delta slope --
fluviomarine bottom --
inlet --
lagoon [coast] (also Landscape) *WI*
lagoon bottom --
lagoon channel --
lake *WJ*
mainland cove --
marine lake --
reef *RF*
relict-tidal inlet --
sea (also Landscape) --
shoal --
sound (also Landscape) --
strait (also Landscape) --
submerged back-barrier beach --
submerged mainland beach --
submerged point bar [coastal] --
submerged wave-built terrace --
submerged wave-cut platform --
tidal inlet --
washover-fan flat --
washover-fan slope --

Microfeatures:

channel (permanent water) --

PART III : SURFACE MORPHOMETRY

A) ELEVATION: The height of a point on the earth's surface, relative to mean sea level (indicate units); e.g. *106 m* (or *348 ft*.)

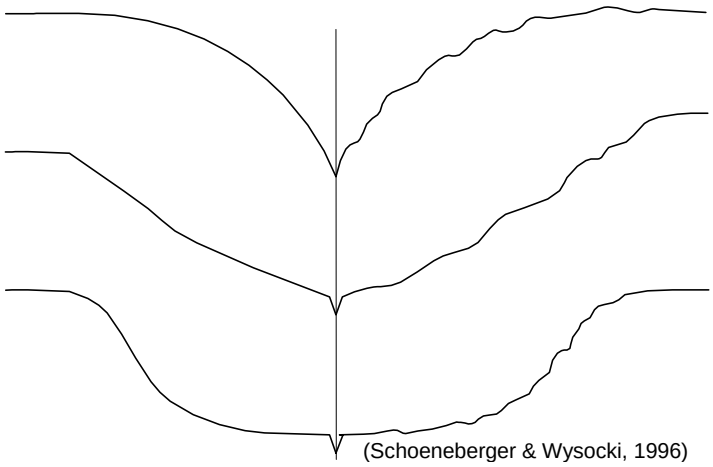
B) SLOPE ASPECT: The compass bearing (in degrees, corrected for declination) that a slope faces, looking downslope; e.g. *218* °

C) SLOPE GRADIENT: Slope gradient (in percent) through the site in the direction that overland water would flow; e.g. *17 %*

D) SLOPE COMPLEXITY:

	Code	
(conventional , NASIS, & PDP)		
simple	*S*	---
complex	*C*	---

Simple **vs.** ***Complex***

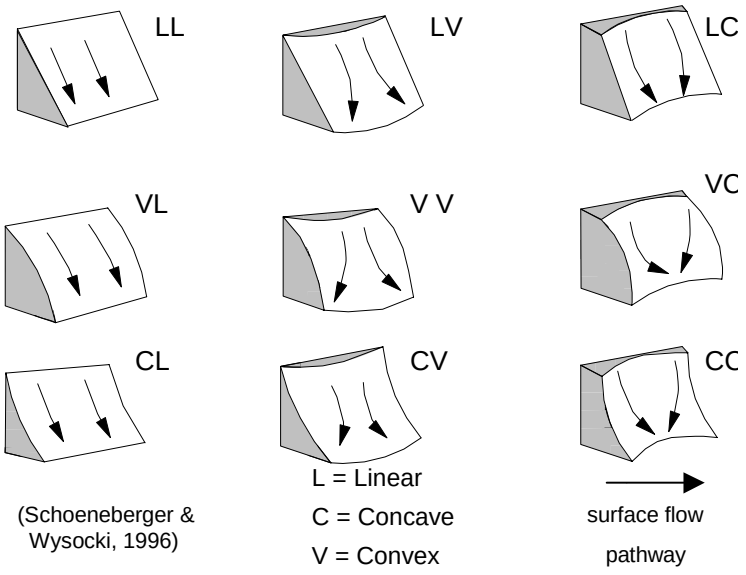


(Schoeneberger & Wysocki, 1996)

E) SLOPE SHAPE: Slope shape is described in two directions: 1) Up & Down slope (perpendicular (normal) to the contour), and 2) Across Slope (along the horizontal contour). e.g. Linear, Convex or *LV*.

DOWN SLOPE (Vertical)	&	ACROSS SLOPE (Horizontal)	*Code* *(conventional*	*PDP 3.5)*
Concave	-	Concave	*CC*	*CC, CC*
Concave	-	Convex	*CV*	*CC, CV*
Concave	-	Linear	*CL*	*CC, LL*
Convex	-	Concave	*VC*	*CV, CC*
Convex	-	Convex	*VV*	*CV, CV*
Convex	-	Linear	*VL*	*CV, LL*
Linear	-	Concave	*LC*	*LL, CC*
Linear	-	Convex	*LV*	*LL, CV*

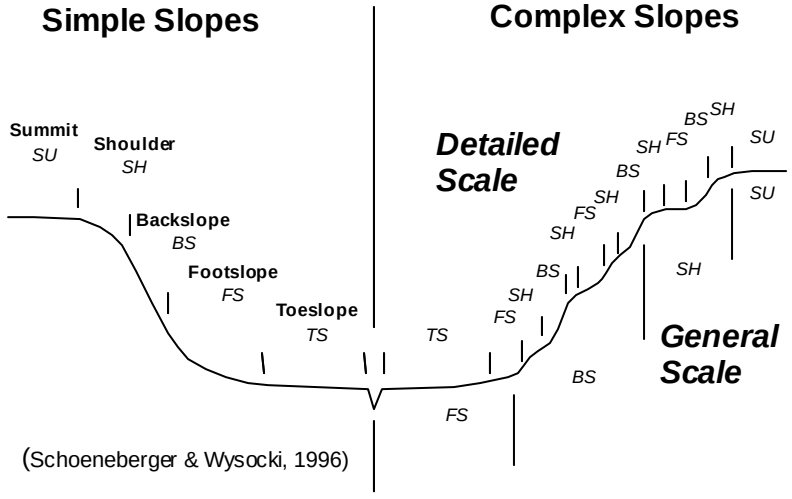
Linear - Linear *LL* *LL, LL*



(Schoeneberger & Wysocki, 1996)

F) HILLSLOPE - PROFILE POSITION : (2 Dimensional)

	Code *(NASIS & PDP)*
summit	*SU*
shoulder	*SH*
backslope	*BS*
footslope	*FS*
toeslope	*TS*



(Schoeneberger & Wysocki, 1996)

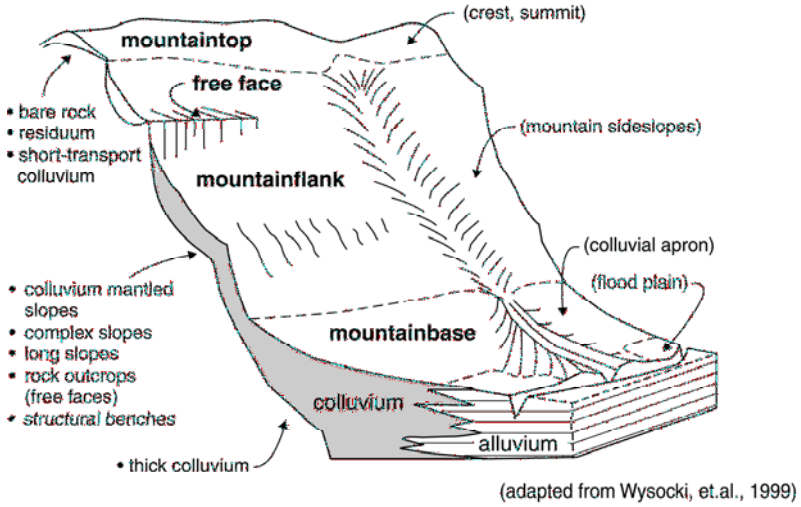
G) GEOMORPHIC COMPONENT : (3 Dimensional)

1) HILLS :

	Code (conventional	NASIS)
interfluve	*interfluve*	*IF*
crest	*crest*	*CT*
head slope	*head slope*	*HS*
nose slope	*nose slope*	*NS*

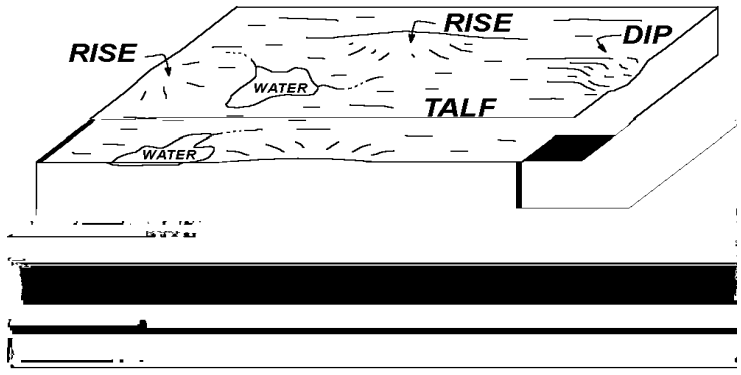
3) MOUNTAINS : *[under development - comments welcome]*

	Code (conventional	NASIS)
mountaintop	---	*MT*
mountainflank	---	*MF*
upper third – mountainflank	---	*UT*
center third – mountainflank	---	*CT*
lower third – mountainflank	---	*LT*
free face	---	*FF*
mountainbase	---	*MB*



4) FLAT PLAINS *[under development - comments welcome]*

	Code (conventional	NASIS)
dip	---	*DP*
rise	---	*RI*
talf	---	*TF*

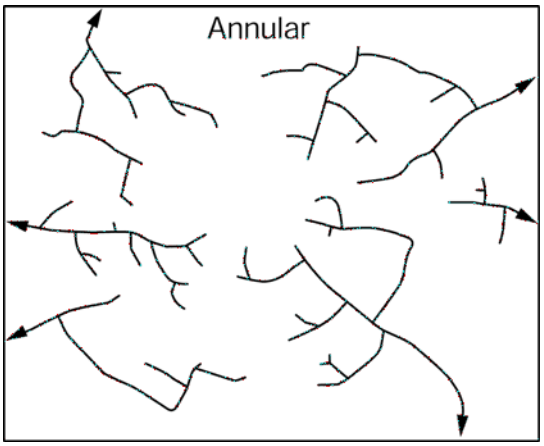


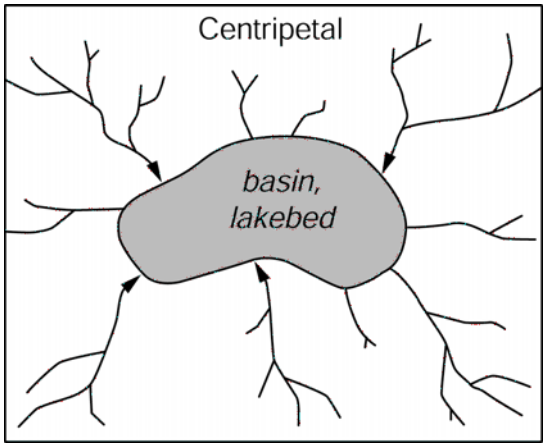
H) MICRORELIEF :

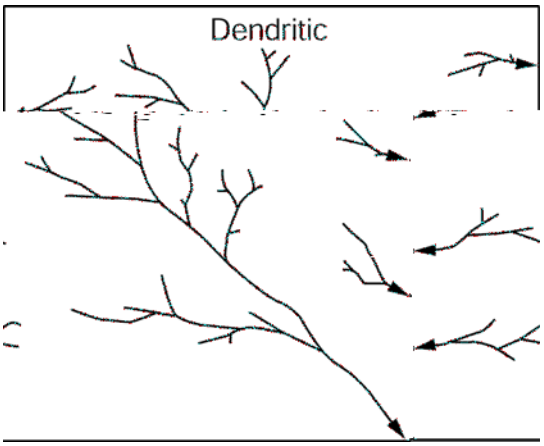
	Code (conventional	NASIS)
micro-high	---	*MH*
micro-low	---	*ML*

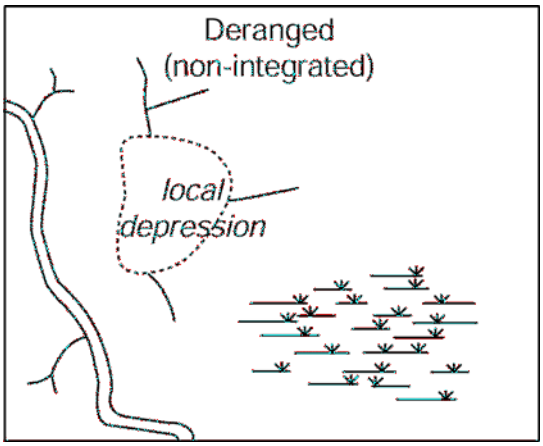
I) DRAINAGE PATTERN :

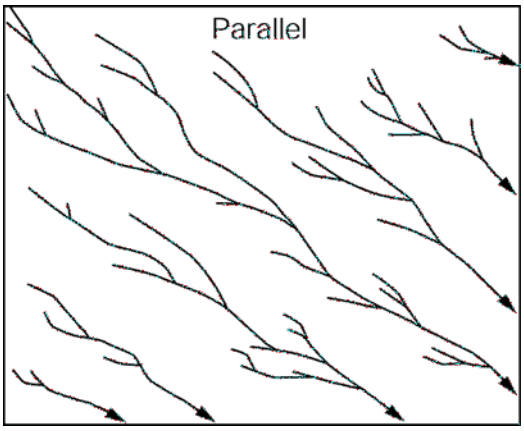
	Code
annular	--
artificial	--
centripetal	--
dendritic	--
deranged	--
karst	--
parallel	--
pinnate	--
radial	--
rectangular	--
thermokarst	--
trellis	--

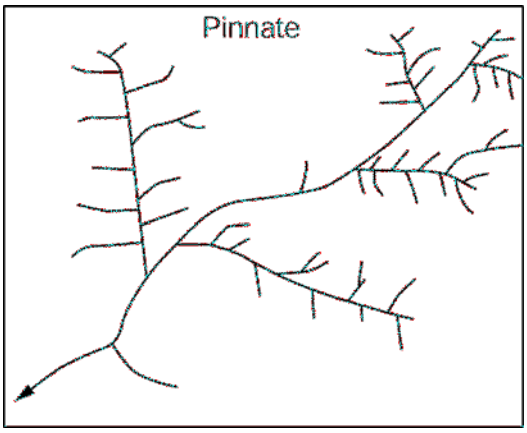


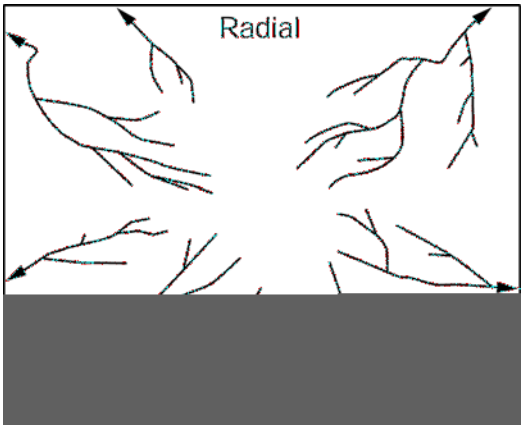


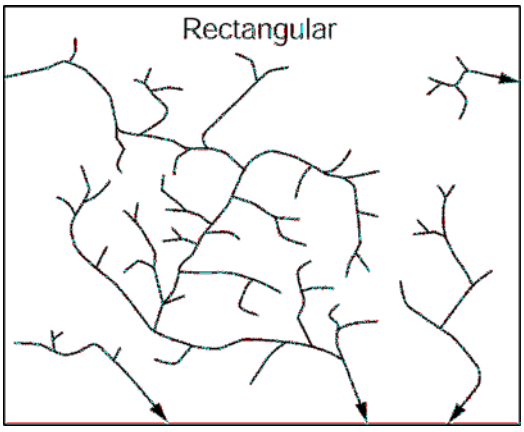


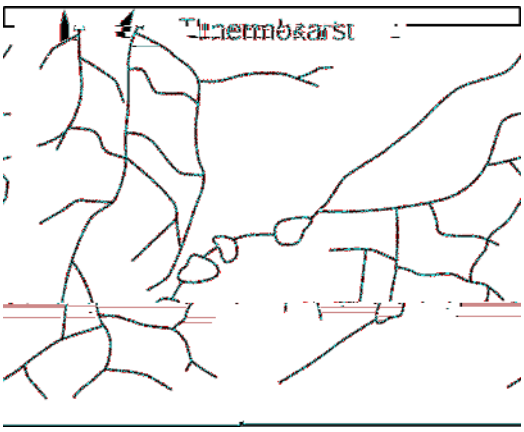


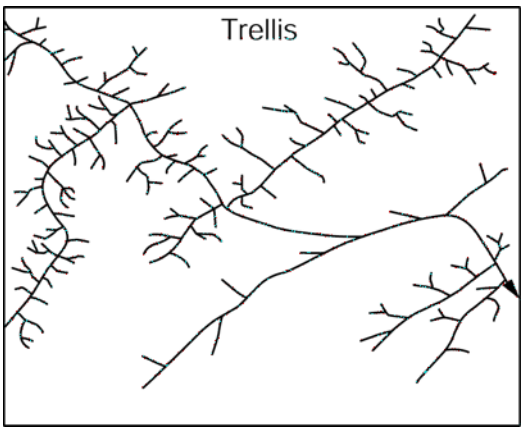

Parallel


Pinnate


Radial


Rectangular




Trellis

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APPENDIX 1: DATA ELEMENT DEFINITIONS

[The following Data Elements (categories) are arranged by occurrence order in the GDS, not alphabetically.]. Definitions are consistent with the current NASIS data dictionary and NSSH, Part 629.]

Physiographic Location

A section within the Geomorphic Description System; it provides a hierarchical scheme for partitioning and identifying related portions of the earth's surface based on geography and physiography. SW

Physiographic Zone

[reserved for global / continental scale groupings; presently not populated]

Physiographic Division

A large portion of a continent of which all parts are similar in geologic structure and climate at a small scale (e.g. 1:5,000,000) and which has consequently had a unified geomorphic history, and whose pattern of relief or landforms differ significantly from that of adjacent areas ~~(Earlier versions called Physiographic Region).~~ Examples: the Laurentian Upland, Atlantic Plain, Rocky Mountain System, and Interior Highlands in the U.S.A. *[The highest level in the Physiographic Location* ***part of the Geomorphic Description System]***.
NASIS Data Dictionary

Physiographic Province

A region of which all parts are similar in geologic structure and climate and which has consequently had a unified geomorphic history; a region whose pattern of relief or landforms differ significantly from that of adjacent region**; i.e. a subset within a Physiographic Division**. Examples: the Valley and Ridge, Blue Ridge, and Piedmont provinces in the eastern U.S.A., and the Basin and Range, Rocky Mountains, and the Great Plains provinces in the western U.S.A. ***[The second highest level in the Physiographic Location part of the Geomorphic Description System].*** **SW &** GG NSSH 629

Physiographic Section

An area which all parts are similar in geologic structure and climate at a relatively small scale and which has consequently had a unified geomorphic history, and whose pattern of relief or landforms differ significantly from that of adjacent areas (**=** Fenneman's **(1957)** "Section"); **i.e. a subset within a Physiographic Province**). Examples: the Mohawk, Green Mountain, and Floridian Sections in the eastern U.S.A. and the Sacramento Section, Puget Trough, and Klamath Mountains in the western U.S.A. *[The third* ***highest*** *level in the Physiographic*

*Location **part of the Geomorphic Description System**]*. **SW &** NASIS Data Dictionary

State Physiographic Area

An area of relatively local extent and whose parts are similar in geologic structure and climate and which has consequently had a unified geomorphic history, and whose pattern of relief or landforms differ significantly from that of adjacent areas; **i.e. a subset within a Physiographic Section**). *[The fourth **highest** level in the Physiographic Location **part of the Geomorphic Description System**].* **SW &** NASIS Data Dictionary

Local Physiographic / Geographic Name

The most localized description of physiographic location; commonly, local feature names found on USGS 7.5 minute topographic quadrangle maps (e.g., Robert's Ridge, Camas Prairie). *[The fifth **highest** level in the Physiographic Location **part of the Geomorphic Description System**].* **SW &** NASIS Data Dictionary

Geomorphic Description

A section within the Geomorphic Description System; it provides a pseudo-hierarchical scheme for identifying natural features on the earth's surface at three relative scales (Landscape, Landform, Microfeature); human created features (Anthropogenic Features) are handled separately. SW

Landscape (*replaces "Major Landform"*)

landscape [soils] – An assemblage, group, or family of spatially related, natural landforms over a relatively large area; e.g. the land surface which the eye can comprehend in a single view. SW & GSST (NSSH 629)

Landform (*replaces "Local Landform"*)

landform - Any physical, recognizable form or feature on the earth's surface, having a characteristic shape and range in composition, and produced by natural causes; a distinct individual. It can span a wide range in size (e.g., *dune* encompasses both *parabolic dune*, which can be several tens-of-meters across, as well as *seif dune* which can be up to 100 kilometers long. Landforms provide an empirical description of similar portions of the earth's surface. SW & GG NSSH 629

Microfeature (*replaces "Microrelief Feature - Kind" and " Microrelief Feature - Pattern"*)

[soil survey] - Small, local, natural forms (features) on the land surface that are too small to delineate on a topographic or soils map at commonly used map scales (e.g. 1:24,000 to 1:10,000). Examples include *earth pillar, patterned ground, frost boil*. Compare - microrelief. SW NSSH 629

Anthropogenic Features

An artificial feature on the land surface (including those in shallow water)**,** having a characteristic shape and range in composition, composed of unconsolidated earthy or organic materials, artificial materials, or rock, that is the direct result of human manipulation or activities; can be either constructional (e.g. *artificial levee*) or destructional (e.g., *quarry*). SW. NSSH 629

Surface Morphometry

a) The geometry, orientation and relief of related portions of the earth's surface.
b) A section within the Geomorphic Description System which provides a scheme for identifying and briefly describing geometry, orientation, position, and relief of portions of the earth's surface. SW

Elevation [survey]

The height of a point on the earth's surface, relative to mean sea level (msl). Compare – relief. SW NSSH 629

Slope Aspect

The compass direction (in degrees, and accounting for declination) that a slope faces, looking downslope; e.g., *287°.* Generalized prose or quadrant descriptions (e.g., "south by southwest") is not preferred and considered obsolete. SW

Slope Gradient

a) The angle of the ground surface (in percent) through a point or site and in the direction that overland water would flow. Commonly called "slope"; e.g., *18%.* SW
b) The difference in elevation between two points, expressed as a percentage of the distance between those points. SSM

Slope Complexity

Used to simplistically describe the relative uniformity (smooth, linear or curvilinear = *simple*) or irregularity (*complex*) of the ground surface leading downslope and through the point of interest. SW

Slope Shape

[also called "Land Surface Shape" in SSM '93, p. 75]

Slope Shape - Down Slope

[*called "up and down the slope" in SSM '93, p 76*]

The geometric, two dimensional profile (shape) of the slope perpendicular to elevation contours. (SSM '93) NASIS Data Dictionary

Slope Shape - Across Slope

The geometric, two dimensional profile (shape) of the slope parallel to elevation contours. (SSM '93) NASIS Data Dictionary

[*i.e. "contour shape"?, after SSM '93, p. 76*]

Hillslope-Profile Position (*replaces "Hillslope Component"*)

~~a)~~ Discrete slope segments found along a transect line that runs perpendicular to the contour, beginning at a divide and descending to a lower, bounding stream channel or valley floor; a discrete piece of a two-dimensional cross-profile of a hill. Positions are commonly separated from one another by inflection points along the line. In descending elevational order, the hillslope-profile positions of a simple hillslope include the *summit*, *shoulder*, *backslope*, *footslope*, and *toeslope*. Not all of these segments (positions) are necessarily present along a particular slope. Complex hillslopes include multiple sequences or partial sequences. Compare – geomorphic components – hills. SW, HP, & RR NSSH 629

Geomorphic Component

A fundamental, three dimensional piece or area of a geomorphic setting (i.e., hills, mountains, terraces, flat plains) that has unique and prevailing kinetic energy dynamics and sediment transport conditions which result in their characteristic form, patterns of sedimentation and soil development. SW NSSH 629

Geomorphic Component - Hills (*replaces "Geomorphic Surface" in PDP*)

A group of fundamental, three dimensional pieces or areas of hills. In descending elevational order, the geomorphic components of a simple hill are the *interfluve* (roughly analogous to the summit); *crest* (a hill top or ridge top of converged shoulders); 3 variations of the hillslope, each distinguished by the surface shape and the nature of overland flow: *head slope* (converging surface or overland flow, especially at the head of a drainageway), *side slope* (parallel surface flow), and *nose slope* (diverging surface flow), *free face* (rock outcrop); and the *base slope* (colluvium / slope alluvium apron at the bottom of the hill). SW NSSH 629

Geomorphic Component – Terraces, Stepped Landforms

A group of fundamental, three dimensional pieces or areas of terraces**,** flood-plain steps, and other stepped landforms (e.g. stacked lava flow units). In descending elevational order, the geomorphic components are the *tread* (the level to gently sloping, laterally extensive top of a terrace or flood-plain step, or other stepped landforms); and the *riser* (the comparatively short escarpment forming the more steeply sloping edge that descends to another level or a channel). SW NSSH 629

Geomorphic Component - Mountains

A group of fundamental, three dimensional pieces or areas of mountains. In descending elevational order, the geomorphic components of a simple mountain are the *mountaintop* (roughly analogous to the crest or summit); *mountainflank* (the long slope along the sides of mountains which can be further subdivided into three portions based on the relative slope location (*upper third-, middle third-, or lower third moutainflank*); *free face* (rock outcrop); and the *mountainbase* (colluvium / slope alluvium apron at the bottom of the mountain). SW NSSH 629

Geomorphic Component - Flat Plains

A group of fundamental, three dimensional pieces or areas of flat plains. In descending elevational order, the geomorphic components of a simple, flat plain (e.g. lake plain, low coastal plain, etc.) are the *rise* [a broad, slightly elevated area with comparatively greater gradients (e.g., 1-3% slopes], the *talf* [a comparatively level (e.g., 0-1% slopes), laterally extensive, non-fluvial area], and *dip* [a slight depression that is not a permanent water body nor part of an integrated drainage network]. Compare - Geomorphic Component - Terraces. SW NSSH 629

Microrelief

a) [soil survey] Slight variations in the height of a land surface that are too small or intricate to delineate on a topographic or soils map at commonly used scales (e.g. 1:24,000 through 1:10,000). Choices include: *microhigh, microlow*. Compare - microfeature. SW NSSH 629

b) (not preferred; refer to *Microfeature*) Generically refers to local, slight irregularities in form and height of a land surface that are superimposed upon a larger landform, including such features as low mounds, swales, and shallow pits. GG

- (obsolete) Refers to differences in ground-surface height, measured over [lateral] distances of meters. Naturally formed features contrast with those that are tillage determined. SSM '93, p 76

Drainage Pattern

The configuration or arrangement, in plan view, of the stream courses in an area**,** including gullies or first-order areas of channelized flow, tributaries, and main streams. It is related to the local geologic materials, geomorphologic features and geomorphic history of the area; major drainage pattern types include dendritic, trellis, artificial, etc., also called drainage network. SW, GG**,** WA

*** CAUTION**: The data elements (categories) in this system are not always 1:1 substitutions or conversions for those of previous NRCS systems (e.g. PDP: Pedon Description Program); "replaces" does NOT necessarily mean "equivalent to", nor does it mean that all the entries within a data element are the same as in earlier versions of PDP. Conversions between databases should be done only after an item-by-item comparison.

APPENDIX 2: Glossary of Landform and Geologic Terms; National Soils Handbook - Part 629, National Soil Survey Center, Lincoln, NE.

[*See the current contents of National Soil Survey Handbook, Part 629 "Glossary of Landforms and Geologic Terms" (Soil Survey Staff, 2007); available at* http://ww.nssc.nrcs.usda.gov *; look under "Standards for Soil Survey" along the left, vertical margin.*]

APPENDIX 3: Excluded terms (formerly used but obsolete or redundant)

Excluded Glossary Terms: Landscape

~~lowland – NP~~ (*reactivated*)
karstland – NP (use *karst*)
peneplain - NR

Excluded Glossary Terms: Landform

active slope - NR (reactivated; FY2000)
alluvial plain - NR (use *floodplain;* ok as a Landscape term)
alluvial terrace - NP (refer to *stream terrace*)
alpine - NR
avalanche track - NR (use *avalanche chute*)
backshore terrace - NP (refer to *berm*)
bald – NP (use summit, mountaintop, etc.).
barrier bar - NR (use *longshore bar*)
beaded drainage pattern - NR (use *beaded stream pattern*)
bench - NP (refer to *structural bench*)
bottomland - NR (use *flood plain*)
braided channel - NR (use *braided stream*)
boulder field - NR (use *block stream*)
coalescent fan - NR ??
coalescent fan piedmont - NP (use *fan piedmont*)
coppice-mound - NR (use *shrub-coppice dune*)
crest - NR (ok as Geom Component - Hills)
crevasse splay - NR (use *flood-plain splay*)
dead -ice moraine - NR (use *disintegration moraine*)
doline - NP (use *sink hole*)
dry wash - NP (refer to *wash*)
elevated lake plain - NP (refer to *collapsed lake plain*)
erosional outlier - NP (refer to *erosional remnant*)
fan terrace - NP (refer to *fan remnant*)
floodwall - NR (*use levee*)
fluve - NP (refer to *drainageway*)
hillside - NR (use *hillslope*)
hill top - NR (use *summit*)
interstream divide - NP (refer to *interfluve*)
meta-stable slope - NR
mountainside - NR (use *mountain slope*)
offshore bar - NR (use *barrier beach, longshore bar*)
remnant - NP (refer to *erosion remnant*)
rise - NP- (ok as a micro, Geom Component - Flat Plains)
rotational slump - NR (use *rotational landslide*)
sand ridge - NP (refer to *longshore bar* or *barrier beach*)
sand volcano – NP (refer to *sand boil*)
scroll - NP (refer to *meander scroll*)
sidewall – NP (use glacial valley wall)
slump – NR (use *landslide* or *rotational landslide*)
splay - NP (refer to flood-plain splay)
spur ridge - NR (use *spur*)
stream channel - NP (refer to *channel*)
structural back slope -NR (use *dip slope*)
terrace slope - NR (use *riser*)
trough end - NR (refer to *cove* or *cirque*)
trough valley - NR (refer to *U-shaped valley*)
trough bottom – NP (refer to *glacial-valley floor*)
trough wall - NP (refer to *glacial-valley wall*)
valley wall - NR (see *valley side*)
wave-cut terrace - NR (use *wave-built terrace*)

Excluded Glossary Terms: Microfeature

catsteps - NP (refer to *terracettes*)
frost polygons - NR (use *patterned ground*)
nets (nonsorted) - NP (refer to *patterned ground*)
nets (sorted) - NP (refer to *patterned ground*)
nonsorted polygons - NP (refer to *patterned ground*)
sheep tracks - NR (use *terracettes*)
soil ripples - NR (use *terracettes*)
sorted polygon - NP (refer to *patterned ground*)
stone nets - NP (refer to *patterned ground*)
swell - NR (ok as a Microfeature)

Excluded Glossary Terms: Anthropogenic

earth dike [use *levee (stream*)]

Excluded Glossary Terms: Process / Morphology

mass wasting – NP (use *mass movement*)
slump (process), slumping – NR (see *rotational landslide*, *landslide*)

APPENDIX 4: Maps (examples of Physiographic Location)

PART I) PHYSIOGRAPHIC LOCATION

A) PHYSIOGRAPHIC DIVISION
(Choices are expanded from Fenneman 1931, 1938)

B) PHYSIOGRAPHIC PROVINCE
(Choices are expanded from Fenneman, 1931, 1938)

C) PHYSIOGRAPHIC SECTION
(Choices are expanded from Fenneman 1931, 1938)

[Note: The three highest levels are primarily contained in Fenneman's 1946 map (reprinted 1957) and provided (in part or in total) here. Areas outside the conterminous US (Alaska, Pacific, Caribbean) are derived from Wahrhaftig, 1964 or are self evident from the Physiographic Location outline).]

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D. STATE PHYSIOGRAPHIC AREA (OPTIONAL)

E. LOCAL PHYSIOGRAPHIC / GEOGRAPHIC NAME (OPTIONAL)

Map 1: Physiographic Areas of the Coterminous US

[Insert Fenneman, 1946 (reprinted1957) map]

Map 2: State Physiographic Areas of

[*choose a representative State; e.g. Landform Areas of Iowa; Prior, 1991* **].**

Map 3: Local Physiographic / Geographic Areas of

[*choose a representative area; e.g.: A portion of a standard, USGS 7.5 minute topographic quadrangle map; or, Raisz, 1941*]